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ANNUAL REPORT

AND

Transactions

OF THE

PLYMOUTH INSTITUTION

AND

Devon and Cornwall

NATURAL HISTORY SOCIETY.

1862—63.

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W. BIRMINGHAM, PRINTER AND BOOKSELLER, WHIMPLE STREET.

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1863.

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REPORT.

1862—63.

It is to be regretted, that the anticipations with regard to the proposed Albert Museum with which the last year's Report opened, cannot be spoken of as having been realized. It is still a subject of hope, however, that such may ultimately be the case.

The Lectures, during the past session, have quite maintained the previously high character of the Institution, having mostly been indicative of considerable research, and marked by traits of original thought. The attendance has been generally good, and the debates well kept up. Some slight variation, in consequence of illness, was made in the list as originally published. The Lectures delivered were as follows :—

1862.			
Oct.	2.	Inaugural Address	The President.
„	9.	Fine Arts	Mr. J. L. Colley.
„	16.	Darwin. (The Origin of Species) ...	„ F. P. Balkwill.
„	23.	Telegraphic Communication	„ W. Saunders.
„	30.	The Evidences (Historical, Traditional, Linguistical, Geological, &c.) of the Antiquity of the Existence of Man on the Earth...	„ W. J. Spry.
Nov.	6.	Some Observations upon Glaciers...	Rev. Eugene Tracey, M.A.
„	13.	Theories of History	Rev. J. Erskine Risk, M.A.
„	20.	Modern Poetry (Second Lecture) ...	Mr. J. V. Fook.
„	27.	A Glance at the International Exhibition	„ J. Shepheard.
Dec.	4.	Ancient and Modern Towns	„ J. Hine.
„	11.	The Life of Francis Bacon	„ J. Shelly.
„	18.	A New Deep Sea Pressure Guage ...	„ J. N. Hearder.
1863.			
Jan.	5.	The World's Products and Antiquities, and the World's Great Exhibitions	„ G. Bartlett.
„	8.	The Evidences of the Bone Caverns in the Torbay District, on the Antiquity of the Human Race ...	„ W. Pengelly, F.R.S.
„	15.	Witchcraft	„ J. Brooking Rowe, F.L.S.
„	22.	Canada and Colonies	„ F. W. Gibbs, C.B.
„	29.	Artistic Anatomy..........................	„ J. J. Offord.
Feb.	5.	The Flora of Tavistock	„ I. W. N. Keys.
„	12.	M. Oppert's recent Discoveries at Babylon and Nineveh..	Rev. J. Erskine Risk, M.A.
„	19.	The Essays of Francis Bacon.........	Mr. J. Shelly.
„	26.	The Spectrum Analysis	„ R. Bishop.
March	5.	Law and Fact	„ H. Whiteford.
„	12.	The Suez Canal	„ W. Morrison, M.P.
„	19.	The Sandstones and Conglomerates of Devon (Second Lecture)	„ W. Pengelly, F.R.S.
„	26.	Notices of the Devon Vertebrates ..	„ J. Brooking Rowe, F.L.S.

Four of these were of local interest, and for that reason are now especially mentioned. Two were delivered by Mr. Pengelly;—the first being on "The Evidences of the Bone Caverns in the Torbay District, on the Antiquity of the Human Race,"—and the second on "The Sandstones and Conglomerates of Devon," being a continuation of one, on the same subject, previously delivered, and printed in the Transactions of last year. The third Lecture was on "The Flora of Tavistock," by Mr. Keys, and the fourth on "The Vertebrates of Devon," by one of your Secretaries. The series of papers, having for their object the scientific investigation of the counties with which the Society is identified, has thus been continued, and it is hoped that no future Session will pass without additions to it. Something similar may be accomplished in relation to the Antiquities and Fine Arts of the Counties.

The Lecture just alluded to as having been delivered by Mr. Pengelly on "The Antiquity of the Human Race" is invested with peculiar interest, not only on account of the attention bestowed by Naturalists throughout the world, at the present time, on its subject, but, also, because it is upon Mr. Pengelly's investigations and discoveries that Sir Charles Lyell, in his recently published work,* lays great stress and elicits from them some of his strongest arguments.

Mr. Pengelly's paper, in continuation of the one printed last year, on the Sandstones and Conglomerates of Devon—Mr. J. J. Reading's List of the Lepidoptera of Devon and Cornwall, Part II—Mr. J. Brooking Rowe's Lists of the Devonshire Mammals and Reptiles—and a List of the Birds of Devon and Cornwall, by Mr. E. Hearle Rodd, one of our corresponding Members, and Mr. J. Brooking Rowe,—all but the first, in continuation of the Fauna of the two Counties, are published with this Report.

It was on Monday, September 8th, 1862, that this Society held its first Field-day. Thirty of the Members and Associates were met at Tavistock by several gentlemen of that town, whose tastes led them to take an interest in the proceedings of the day; three parties were then formed for excursions in different directions, viz.:—Endsleigh, Peter Tavy, and Staple Tor, and Prince Town. At the general reunion of excursionists,—which took place in the evening, at the Bedford Hotel, Tavistock,—accounts of the day's rambles were interchanged, comprising, among other matters, historical and antiquarian details as to Tavistock, a botanical ramble to Peter Tavy, and a visit of exploration to the Druidical Circles at Merivale Bridge. The paper on the Flora of Tavistock, which was read to the Society on the 5th of February last, may be instanced as one result of the Field-day.

The Annual Conversazione was a decidedly successful one. This result was mainly attributable to the zeal and skill of Mr. Phillip Mitchell, who, with his accustomed taste, arranged the various articles of vértu which his exertions had collected from far and near. The Institution is also much indebted to Mr. R. Oxland, Jun., for his long continued and effective aid. The number of those who kindly contributed to the exhibition of the evening was so large that to particularize names might seem invidious; thanks are, however, especially due to a gentleman of the neighbourhood, who was willing to incur the risk connected with the removal of a large collection of Japanese and Chinese curiosities, as fragile as they were valuable. The whole collection, as might have been anticipated, attracted considerable attention; and as the opportunities for inspection were but few during the crowded Conversazione, the Council arranged for its remaining at the Athenæum for the two following days, during which it was visited by a large number of Members and their friends.

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* "The Antiquity of Man," by Sir C. Lyell, F.R.S., 8vo., Lond, 1863. Chap. vi.

The Museum has for some time past been under repair, and is, therefore, for the present virtually closed. Two new cases, for the reception of specimens, have been fixed at the south end of the Museum, on either side of the window.

A Subscription List has been opened among the Members and Associates, for the purpose of obtaining a Collection of the Fishes of Devon and Cornwall, to be placed in the Museum. Any Donations forwarded to Mr. J. J. Reading, or to either of the Secretaries, at the Athenæum, will be promptly acknowledged.

Mr. E. Hearle Rodd, in a communication dated February 9th, 1863, informed the Society of an addition to the British Fauna, viz.:—"*Muscicapa parva*," the Red-breasted Fly-catcher [vide Gould's Birds of Europe, part xiv., pl. 13. Bree's Birds of Europe, vol. i, p. 179.] This bird was killed in the parish of Constantine, near Falmouth, in January last: its mate was also observed but not captured. Very little is known respecting this species. In the breeding season it is found in the Crimea, and also in the forests of Hungary. It is but an accidental visitor in France, Switzerland, and Italy. It bears a certain resemblance to our well-known Robin [*Sylvia rubecula*], and in its habits is said to be similar. The counties of Devon and Cornwall thus claim the two most recent additions to the British Avi-fauna, *Larus ichthaëtos*, having been taken near Exmouth not long since.

In Botany, the following extracts from Mr. Keys's Report to the Members, at their Annual Meeting, may be interesting—

"On the 27th May found *Carum Carui* on rubble at the Great "Western Docks. *Botrychium Lunaria* was reported to me by Mr. H. "C. Hodge as having been found by him on Kit-hill, near Callington; "and Mr. Brent informs me that the same fern has been collected by "him between Shaugh and Cadover Bridge. On June 27th found "*Sagina subulata* near Shaugh Bridge: a new habitat, I believe, for "this plant. On July 12th Mr. F. P. Balkwill collected specimens "of *Chlora perfoliata*, between Stratton and Launceston. On August "6th found, in company with Mr. Briggs, *Hypericum linariifolium*, "near Maristowe. This is one of our rarest plants; and we felt glad at "having had an opportunity to confirm its continuance in this locality, "where it had been discovered several years before by another of our "townsmen and associates, Mr. Goulding. On the same day we "gathered *Scirpus Tabernæmontani*, near Lophill. I am not aware "that this plant has before been recorded as a native in this locality. "On August 18th found, at Cawsand, in company with Mr. Briggs, "*Antirrhinum Orontium;* at Rame Head, *Juncus maritimus, Rosa* "*rubiginosa*, and *Rosa spinosissima;* and near the Rame Preventive "Station, *Lotus tenuis*. Mr. F. P. Balkwill brought home to me, "on August 29th, some very luxuriant specimens of *Veronica* "*Chamædrys* from Liskeard Churchyard, having the leaves distinctly "stalked, instead of sessile as they generally are in this species."

Mr. T. R. A. Briggs has kindly offered to present to the Museum a number of Eggs of Devon Birds, principally collected by himself. This donation is likely to prove valuable, not only in itself, but as a nucleus for a much larger collection of Eggs of the Birds of both counties. Mr. Vicary, of Exeter, has also offered to present to the Museum a collection of Devon Minerals and Fossils. Both these for the present remain in the hands of their donors, until the repairs, &c., of the Museum are completed.

In connection with Natural History, the following works may be mentioned as having been completed during the past year:—the first and second volumes of "The History of British Fishes," by our corresponding member, Mr. Jonathan Couch; the first volume of "The British Sessile-eyed Crustacea," by our member, Mr. C. Spence Bate, in conjunction with Mr. J. O. Westwood, the Oxford Hope Professor of Zoology; and the Catalogue of the Amphipodous Crustacea of the British Museum, by Mr. C. Spence Bate.

The Queen has been pleased to grant to two of our Members, Civil List Pensions,—to S. P. Tregelles, L.L.D., on account of his valuable labours on subjects connected with Biblical criticism, and to George Bartlett, in appreciation of his pursuit of the Natural and Physical Sciences during thirty-six years, resulting in the publication of many works.

The exterior of the Athenæum, which has for some time past been much out of order, has been thoroughly repaired, and is now being repainted.

An alteration in Law 57 was made at an adjournment of the Annual Meeting. The Law now stands as follows:—

> LAW 57.—"No law shall be enacted or varied except with the "consent of the majority of the Members present at the Annual "Meeting, and then only after fourteen days' notice to each Member, "which notice shall distinctly specify the nature of the proposed

"alteration; or else at a Special Meeting convened for the purpose, by "the President; or at the request of eight members, by a like notice. "Two-thirds of the Lecturing Members, at least, are required to con-"stitute a Special Meeting, competent for such a purpose."

The following are among the works added to the Library during the past year:—

Theories of History, 8vo.
Aristotle's History of Animals, 12mo.
Carpenter's Foraminifera, fol.
Hofmeister's Higher Cryptogamia, 8vo.
Oppert's Discoveries at Nineveh, 8vo. and fol.
Wallich's Deep-sea Soundings, part i., 4to.
Kirchoff's Spectrum Analysis, 4to.

The following are received in exchange:—

Reports and Transactions of the	Literary & Philosophical Society	*Liverpool.*
„ „ „	Natural History Society	*Dublin.*
„ „ „	Geological Society	*London.*
„ „ „	Geological Society	*Dublin.*
„ „ „	Geologists' Association	*London.*
„ „ „	Devonshire Association	
„ „ „	Zoological Society	*London.*
„ „ „	Berwick Naturalists' Field Society	*Berwick.*
„ „ „	Tyne-side Naturalists' Field Club	*Newcastle.*
„ „ „	Royal Cornwall Polytechnic Society	*Falmouth.*
„ „ „	Royal Institution of Cornwall .	*Truro.*
„ „ „	Literary & Philosophical Society	*Manchester.*
Report of Patent Office		*Washington.*
„ Smithsonian Institution		*Washington.*

This Report may now fitly be brought to a conclusion by calling fresh attention to a notice, prefixed to the Prospectus of Lectures for the Session 1854—55.—"The Society was constituted for the purpose of training its members in habits of investigation and thought, as well as affording opportunities for acquiring facility of expression in the delivery of the sentiments to which subjects under discussion might give rise." By keeping these objects constantly in view, the Plymouth Institution cannot fail to steadily progress in the favour of a discerning public.

J. BROOKING ROWE, F.L.S., } *Hon.*
J. ERSKINE RISK, M.A., } *Secs.*

TREASURERS' REPORT.

MAY, 1863.

We beg to present the Account of Income and Expenditure for the year just ended, by which it will be seen that the Expenditure exceeds the Income,—this is in consequence of Cash advanced on the Account of the New Museum.

J. L. COLLEY, } *Hon.*
J. DABB, } *Treasurers.*

An Account of the Expenditure and Income of the Plymouth Institution,

FOR THE YEAR ENDING APRIL, 1863.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Repairs	15	7	8	By Balance from last account	54	2	2
,, Printing	11	8	7	,, Subscriptions, &c.	139	2	6
,, Library	21	9	4	,, Rent of Hall	23	5	6
,, Lighting	17	14	2	,, Naval Bank	4	4	0
,, Taxes	0	16	0				
,, Salaries	12	0	0				
,, Interest	8	0	0				
,, Incidentals	27	9	6				
,, Apparatus	19	13	6				
,, Conversazione	6	11	0				
,, Reports	17	4	9				
,, Balance carried down	62	19	8				
	£220	14	2		£220	14	2
To Advanced on account of New Museum	24	9	4	By Balance brought down	62	19	8
,, Balance	38	10	4				
	£62	19	8		£62	19	8

THE INSTITUTION IN ACCOUNT WITH THE NAVAL BANK.

Dr.	Cr.	£	s.	d.
Examined and found correct, April 9th, 1863.	Due to Naval Bank per last account	195	16	0
J. BOSWARVA, ALBERT P. PROWSE, } *Auditors.*	Cash	4	4	0
		£200	0	0

THE
RED SANDSTONES, CONGLOMERATES, AND MARLS OF DEVONSHIRE.

Part II.

BY W. PENGELLY, F.R.S., F.G.S., F.A.S.L., &c.

THE

RED SANDSTONES, CONGLOMERATES, AND MARLS OF DEVONSHIRE.

Part II.

BY W. PENGELLY, F.R.S., F.G.S., F.A.S.L., &c.

When, upwards of a year since, I had the pleasure of directing the attention of the members of the Institution to the Red Rocks of Devonshire, I stated that they occupy the greater part of our county east of a line extending—with some marked irregularities,—in a northerly direction, from the central shores of Torbay to Porlock in West Somerset; that several "outliers" exist, in widely separated localities, west of this line, and thus indicate a much wider extension of the formation in earlier times; that they are of littoral origin; that no fossils or organic traces have been recorded as occurring in them; and that they belong to the group of rocks known to geologists as the Lower Trias, in other words they lie at the base of the great Mesozoic series of formations.

In now resuming the subject, I purpose confining myself to South Devon, and chiefly to the sea-bord between Goodrington Sands, in Torbay, and the headland known as the Flat Point, between Exmouth and Budleigh Salterton.

Within the district just named, the Red rocks are of three kinds:—Conglomerates, Sandstones, and Marls. Following the cliff section, we have, in Torbay, Conglomerates and Sandstones with a few thin layers of Marl. There is no very decided order of succession, but, on the whole, the Sandstones may be said to preponderate. Wherever the base of the formation is seen, however, it consists of very coarse Conglomerate, as in the outliers at the north end of Saltern Cove (see Fig. 1, in the "Transactions" for 1861—2) and at the southern end of Goodrington Sands. In the fine section at the north extremity of the same sands, the lowest visible beds are of very fine Sandstone and the uppermost of Conglomerate (see Fig. 1). From Petitor, north of Torquay, to near Dawlish, the cliffs consist of Conglomerates with a few beds of Sandstone. Occasionally a bed essentially Conglomerate contains a patch of Sandstone, and in some instances the same stratum is found to be pretty equally divided, one-half its thickness being made up of the former while the other half consists of the latter only.

Between Dawlish and Langstone Point, at the mouth of the Exe, Sandstones almost exclusively prevail, but Conglomerates reappear at Langstone; and, on crossing the Exe, we find them again at Lympstone and Exmouth. At a short distance east of the latter they entirely disappear, and Marls, instead of being, as heretofore, very exceptional, form an important part of the cliff section.

It may not be out of place to remark here that the uppermost portion of the red cliffs in various parts of the district belongs, not to the Triassic, but to a much more modern, period. Thus at Hollacombe, between Paignton and Torquay, there is a considerable accumulation of coarse angular material; and between Dawlish and the mouth of the Exe, as well as on the opposite side of that river, there are large deposits of gravel made up, amongst other things, of Cretaceous detritus. These overlying masses form no part of our subject, and must be dismissed with the remark that they have been laid down since the surface configuration of the district was essentially the same as at present.

In the succession just given, a chronological order has been followed. From Torbay to the Flat Point we pass upwards from the base of the formation. It is, perhaps, worthy of remark that from Petitor to Teignmouth the coast runs about due north, thence to Langstone Point it gradually takes a north-easterly direction, whilst from Exmouth its course is nearly due east until reaching the Flat Point, which, as a narrow peninsula, trends southwards. In this strip of land we find a relic of beds which do not appear to be represented elsewhere along the entire coast; they consist of a breccia of small, angular, almost black stones, in a paste of Marl and Sand; the whole so very loose and inadherent that it is almost impossible to bring away a specimen of it.

From Goodrington Sands to Hole Head, between Teignmouth and Dawlish, the Conglomerates are mainly composed of fragments of the Devonian rocks of the immediate neighbourhood; limestone detritus being especially abundant. These calcareous nodules generally contain fossils, most of which, as might be expected, are the prevalent forms found in the parent limestone beds of the district; thus the sponges *Stromatopora polymorpha and S. placenta*, so characteristic of the Bishopsteignton limestone, are the prevalent fossils in the Conglomerate pebbles from the mouth of the Teign to Hole Head; whilst *Smithia Hennahii*, so common at Barton, near Mary Church, as to have obtained the local name of "Barton Star," is one of the prevalent fossils in the Conglomerate cliffs of the same parish. So well established is this generalization, that a fossil collector can as readily name the *Conglomerate* locality whence a nodule containing a characteristic fossil was taken, as he can the *Limestone* quarry in which the same organism was met with. On the other hand such cosmopolitan forms as *Stromatopora ramosa* and *S. concentrica* occur everywhere, both in the parent, and in the derivative, beds.

Fragments of Devonian slate are as abundant as, from the soft and fissile character of the material, could be expected.

Pieces of Sandstone, undoubtedly of Triassic origin, are occasionally met with.

From Hole Head to Langstone Point limestone fragments are rare, and the materials seem to have been mainly derived from the Carboniferous country between Haldon and Exeter, and west of that line.

Trap pebbles are numerous everywhere, and seem to be referrible to two distinct kinds of rock; one of which is apparently identical with the trap of Pocombe Hill, near Exeter, and other localities north and north-west of Haldon. There seems some difficulty in identifying the second kind. Not unfrequently they are porphyritic, the large felspathic crystals being sometimes of the variety known as *Murchisonite*; which, according to Mr. R. Phillips, consists of Silica 68.6, Alumina 16.6, and Potassa 14.8.* Pebbles of this nature are more or less abundant between Petitor and Teignmouth.

Many of the porphyritic nodules are found, especially at Livermead in Torbay, in a state of decomposition, and are, in some instances, reduced to a more or less plastic paste.

Though Greenstone abounds in various places near the Conglomerates, extremely few fragments of this rock occur in them; this is the more remarkable since it is well known that some of the Greenstones are of pre-Triassic age. Thus, Mr. Godwin-Austen has shown that some of them are contemporary with the older Devonian slates,† and the volcanic ash on the flanks of the Greenstone of Knowle Hill, at Newton Bushel, contains the

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* "Outlines of Mineralogy, &c.," vol. i, page 289.

† "Geol. Trans.," vol. xi, part ii, page 470.

Devonian trilobite *Trimerocephalus lævis.*[*] Greenstone, apparently intrusive, occurs mixed up with the slates and limestones of Babbacombe within a stone's-throw of the great "fault" at Oddicombe, where the Devonian and Triassic rocks abut against each other, as described in my former lecture (see Fig. 3, in "Transactions" for 1861-2). I have searched frequently, and with care, for a Greenstone pebble amongst the conglomerated materials there, and have endeavoured to bear in mind the great changes which this rock undergoes under atmospheric exposure, but I have never detected anything which it seemed possible to refer to the neighbouring Greenstone.

Fragments of quartz are by no means rare; many of them upwards of six inches in mean diameter. Veins of this mineral are more or less numerous in the Devonian slates of the county, and were probably the source whence those nodules were derived.

The Conglomerate outlier at Thurlestone, in Bigbury Bay, consists mainly, if not exclusively, of detritus of the crystalline schists which occupy the southern angle of Devonshire, from the Start Point to the Bolt Tail; the latter being about a mile East of Thurlestone.

Perhaps the most interesting objects found in the Conglomerate are the *Beekites*, so named from the late Dr. Beeke, Dean of Bristol, by whom they are believed to have been first publicly noticed. Without being closely examined they would probably be confounded with the pebbles with which they are associated, and which they resemble in form and dimensions. They vary from half-an-inch to a foot in mean diameter; but these extremes of size are not frequent, the more common dimensions being from three to six inches.

Their surfaces are covered with *Chalcedony*, generally arranged in tubercles, each of which is not unfrequently surrounded with one or more rings, and occasionally the same ring invests two or more tubercles. The latter vary in size from that of a small pin's head to an average pea. In some specimens the Chalcedony seems to be arranged on two different types, or, more correctly, the same type on two different scales.

When broken, the interior of the Beekite is found to be *Calcareous*. In most instances the nucleus is only partially attached to the crust of chalcedony, sometimes it is completely detached and rolls about within the cavity when shaken; not unfrequently it is reduced to a dark-brown, iron-grey, or almost white powder, which effervesces in acids. A similar powder surrounds decomposing, fossiliferous, calcareous nodules in certain limestone rocks, as may be well seen in Woolborough quarry, near Newton Abbot. Occasionally only a few grains of matter remain within the crust, in which case, as might be expected, the Beekite is so light as to float in water.

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[*] "Geologist," vol. iv, page 343.

I have never met with a non-fossiliferous nucleus; occasionally a doubtful specimen has presented itself, but the organic structure has been readily displayed by subjecting the nucleus to the action of muriatic acid, or by having it cut and polished. All the fossils belong to the ***Devonian*** series, and are either sponges, corals, or shells—generally spiral univalves;—upwards of a dozen such shells have been found in a single nucleus. Even when the nucleus is dissolved into powder the structure of the sponge or coral, of which it is the frail memorial, is sometimes quite evident, but is irrecoverably effaced by a touch or even by a gust of wind. Frequently the organic structure is also preserved on the inner or concave surface of the enveloping crust; it is no rare occurrence to find the latter broken and empty, but still to be able to determine by what fossil it had been occupied, from characters traced on its inner surface. In most cases the outer surface of the crust is destitute of organic traces, but specimens are occasionally found in which the structural character of the enclosed nucleus is evident on the exterior.

When the nucleus is partially or wholly detached but not reduced to powder, it still appears to be undergoing slow decomposition, the destructive process sometimes penetrating quite through it, but more frequently reaching to only a short distance below the surface.

All the detached nuclei on which I have experimented have been either completely decomposed by muriatic acid, or have left only a very small quantity of granular matter. The amount of silex which they contain by no means exceeds that found in many ordinary limestones. Occasionally coral stems passing through the nucleus are silicified whilst the remainder is purely calcareous, so that casts of the corals are easily obtained by the aid of acids.

As the sea rapidly encroaches on the Conglomerate shores of Torbay, Beekites frequently fall from the cliffs and are covered by every tide, consequently they are exposed to the mechanical action of the waves and of the pebbles amongst which they have fallen; such specimens, as well as those low enough in the cliff to be operated on by the same agents, bear many and evident marks of abrasion; and, in this respect, differ greatly from such as are not thus exposed; the tubercles and rings on the latter being sharp, well-defined, and unscratched; whilst on the former they are much worn, and occasionally almost effaced.

Beekites are found in every part of the Torbay Conglomerates, but they are much more abundant at Livermead Head and Paignton harbour than elsewhere in the district. I have given much careful attention to the subject for many years, but have never met with a Beekite except in the red rocks of Torbay. Mr. W. Vicary informs me, however, that some have been found in the Conglomerate at the Ness Point at the mouth of the Teign, and also at North Tawton. He has called my attention, also, to the fact that the characters of the

Beekite are frequently seen in the Greensand fossil shells of Haldon; in this case, however, the fossils are entirely silicified, not merely coated with chalcedony as in the Torbay specimens. My friend, Mr. C. W. Peach, some time since, sent me a small specimen which he had found in the north of Scotland. The facts that one penny stamp paid its postage, and that Mr. Peach requested it might be returned to him, will serve to show both the small size and the rarity of Beekites in that region. Mr. A. Williams has also sent me a small specimen from the mountain Limestone of the Mendip hills. So far as I have seen, the Beekite is invariably formed on a calcareous fossil nucleus.

But to return. Since, as has been stated, the nuclei are calcareous and contain Devonian fossils, they are, undoubtedly, portions of the adjacent Devonian limestone; and, as the Conglomerates must be regarded as ancient sea-beaches, these limestone fragments must have been pebbles on those beaches; and, consequently, they must have been rolled and abraded as pebbles necessarily are under such circumstances. Now had they then possessed their crusts of chalcedony these would have been scratched and worn as in the case of the Beekites which have been rolled on the modern beach; but it has already been stated that they are in all cases quite free from marks of this nature, hence it seems safe to conclude that the chalcedony has been deposited on them since the cementation of the Triassic Conglomerate.

Though the nuclei are sometimes more or less silicified, the fact that they are frequently—more frequently than otherwise—purely calcareous proves that this character cannot be regarded as an essential character of the Beekite; hence the formation of the crust of chalcedony does not depend on the silicification of the nucleus, though probably the latter may have resulted—at least in some cases—from a continuation of the process by which the former was effected.

From a consideration of all the facts of the case, it seems probable that, after the formation of the Conglomerates, water, holding carbonic acid and silex in solution, percolated through the rock, that the acid dissolved, and the water removed, the carbonate of lime of which the pebbles consisted, and that the silex replaced the calcareous matter. Notwithstanding its being completely invested with chalcedony the nucleus appears in some cases to have continued very slowly to decompose but not to be silicified, in others no change followed the formation of the crust, whilst in a few instances the entire mass was more or less replaced by chalcedony.

The fossilization of organic remains is confessedly not well understood, but it does seem possible that the chalcedonizing process might, in some cases, extend through the crust already formed to the nucleus within, or to portions of it; or, since we frequently find that organic remains in ordinary limestone rocks are more or less siliceous, as everyone knows to his cost who has collected fossils which require to be polished, it is possible that the nucleus might have received the silex it contains in common with the bed of limestone of which it was a part, and, therefore, before the deposition of chalcedony on its surface, by which it was converted from a common limestone pebble into a Beekite. Probably the siliceous character of some of the nuclei may be attributable to one of these modes and some to the other, but it does appear certain that the crust was deposited on the surface and was in no way derived from the nucleus as has been sometimes supposed. I recently met with a fact strikingly confirmatory of this. I found a Beekite, or rather two, formed on the two portions into which a stone had been broken, apparently after the cementation of the conglomerate had taken place; the fragments were so nearly in contact, and fitted each other so perfectly, that no doubt of their having been originally united could be entertained. The two additional surfaces which had been formed by the fracture were coated with chalcedony in the ordinary manner.

On whatever surface chalcedony is deposited it appears in most, perhaps in all, cases to assume a tubercular character, hence the tubercles on the surface of the Beekite; but whilst this property will always be present, the exact arrangement will probably depend somewhat on the nature of the surface on which it is deposited. Suppose decomposition to commence at various points or centres on the surface of the calcareous pebble, the chalcedony deposited on these points would form the central tubercles; let the decaying process extend from and around these centres, the chalcedony deposited around each tubercle would form a ring; in like manner a succession of rings would be formed until they touched, after which a more comprehensive one might invest two or more of the systems already formed, until the whole surface was covered. Should the centres of decomposition be at very different distances on different specimens, or on different parts of the same specimen, this would produce the different scales of the type on which, as has been said, the chalcedony is sometimes arranged.

In a paper on "The Composition, Structure and Formation of Beekite," by Mr. Arthur H. Church, F.C.S.,* the following analysis of Beekite (i. e. the chalcedonic crust) are given.

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* Philosophical Magazine for February, 1862.

SPECIMENS.	I.	II.	III.	IV.	V.	VI.	VII.	MEAN
Silica	90·707	93·037	93·115	92·7	92·707	91·96	92·119	92·35
Lime	·44	2·26	2·76	3·031	2·7	1·35	3·03	2·22
Alumina and Phosphate of Alumina	·075	trace	·002	·06	·012	trace	trace	·04
Sesquioxide of Iron	5·09	1·01	·097	·07	·78	2·94	2·16	1·74
Magnesia	·002	·014	·007	trace	trace	trace	·021	·01
Soda..................	·03	·075	·019	·017	trace	trace	trace	·04
Potassa	trace	trace	trace	trace	trace	trace	trace	trace
Lithia	...	...	...	...	...	...	trace	trace
Water	·7	1·072	1·56	·96	1·76	2·1	·17	1·19
Carbonic acid and Organic matter	2·27	1·53	2·44	2·51	1·97	1·64	2·29	2·09
Chlorine (probably combined with the Sodium	·04	·091	trace	trace	trace	trace	trace	·06
Loss	·656	·911	...	·652	·071	·01	·21	·26

The same author, treating of the Chemical causes concerned in the formation of Beekite, describes the following experiment :—" A fragment of recent coral was fitted into the neck of a funnel and a one per cent. solution of silica (prepared from silicate of potash by Graham's dialytic method) containing a little carbonic acid gas, was allowed to drop slowly on the coral and filter through : after a time the liquid ceased to pass. The filtrate contained no *silica* but *much carbonate of lime.* The fragment of coral had lost nearly all its lime, but had retained its structure in great measure ; it was, however, covered with a thick film of gelatinous silica, and was very soft. In such a reaction as this, it is not unlikely that a small portion of lime would be retained as silicate. Where the process of silicification has gone on to its completion, we have a tolerably exact reproduction in silica of the original organism, the result being in the case of corals, sponges, &c., a light hard porous mass, occasionally hollow, of chalcedony. But where the process has been arrested by the stoppage of the flow of the siliceous solution, the central portions of the Beekite have retained nearly their original composition as well as structure ; and in some rare instances it would seem that a subsequent deposition of carbonate of lime in the spaces not occupied by silica, had taken place."

The *Sandstones* frequently contain numerous scales of both *black and white mica,* the former being most prevalent in Torbay, the latter beyond the Exe. " Plates " of " *Iron sand* " are abundant, especially at and near Dawlish, where they are termed "Pan," or "Iron-pan" by the workmen. These plates by no means coincide, as a rule, in position or direction, with the planes of stratification. They "weather" less rapidly than the pure sandy portions of the beds, and, hence, they stand out in relief in the cliff sections, and occasionally assume very grotesque forms. Before the construction of the South Devon Railway, the "Pan" in many instances projected, upwards of a foot, from the Sandstone Cliff between Dawlish and the Exe; and in the recesses thus formed, birds—ravens, hawks, choughs, and others—built their nests in great numbers. The cliffs were cut back during the railway operations, so that the haunts of the birds were destroyed. The "Pan" is however, again becoming prominent, and may thus furnish a sort of measure of the waste of the Sandstone there.

A few years since, a builder informed me that he had dug five wells, at Dawlish, varying in depth from 83 feet to 120 feet; that the deposits were alternately "Iron Sand" and "Soft Sand," the former in beds from twenty to thirty feet in thickness, whilst the latter, in some instances, did not exceed two or three feet; that the "Iron Sand" was invariably compact, hard and brittle, and bounded at the lower surface of the bed by a band of "Pan;" and that when water was found it occurred in all cases immediately below a band of this kind, through which it gushed up, in considerable volume, from the "Soft Sand" beneath.

The "Iron Sand" occasionally appears in the form of balls, in most cases sensibly spherical but occasionally pyriform; and sometimes a number of them appear in botryoidal clusters. They vary in dimensions from the size of a man's fist to that of hazel nuts; an inch in diameter is a common size.

Though the entire formation is termed *Red*, it must not be supposed that this is the only colour it exhibits; indeed in a few localities—especially at the Corbons, a small low headland between Tor-Abbey and Livermead Sands in Torbay—yellow and other light-coloured beds are interstratified with those of a red hue; whilst in some other districts a bed of Sandstone or fine Conglomerate suddenly and, as it were, capriciously exchanges its prevalent red for yellow, drab, or white. Not unfrequently a change of this kind is of a very limited vertical, as well as horizontal, extension, being confined to a portion of the thickness of a single stratum; occasionally the light-coloured material occupies what appear to be sun-cracks in a red stratum, thereby assuming the appearance of a course of masonry composed of red bricks, which have been recently "pointed up" with whitish cement.

On the whole the *Red* Sandstones are a bright brick red, the Conglomerates have a dark-purplish tinge, and the Marls present a dull earthy chocolate aspect. So general are these distinctions that it is easy to distinguish Sandstones, Conglomerates and Marls from each other at a considerable distance, and to determine the prevalent rock in a cliff section by its colours alone.

Between Livermead and Paignton Sands circular yellowish patches, from half an inch to three inches in diameter, occur in the red beds. When inspected, each is found to be a section of a sphere containing a nucleus of stone, which may be angular, sub-angular, or rounded; sometimes it is a fragment of trap, at others limestone which may or may not be fossiliferous. In some districts—as at Watcombe, for example—nothing of the kind is seen, whilst at Livermead Head and elsewhere they are very numerous; but no where are all, or even a majority of, the stones thus surrounded. There is no unoccupied space between the nucleus and the investment, the latter in all cases fitting the former very closely. There does not appear to be anything like a constant ratio between the dimensions of the nucleus and those of its environment, since large spheres contain large or small nuclei indifferently.

In the Marls east of Exmouth greenish spheres, of the size of those just described, and minute specks are extremely numerous. Here, however, nuclei do not constantly, or, perhaps, frequently occur; nor are those which present themselves stones; they appear to differ from the matter surrounding them mainly in colour, which is commonly a dull olive green, sometimes approaching to black; indeed most of them have a very dark or black central spot. The nucleus sometimes sends a few short, thin, and somewhat widely-separated rays into the greenish matter surrounding it.

The sea does not appear to act with greater or less rapidity on the yellowish spheres of the Conglomerates or the greenish ones of the Marls than it does on the red rocks in which they respectively occur: omitting the nuclei, they neither form protuberances or depressions in the general surface of the rock.

Briefly to recapitulate the different colour phenomena, we have:—

1st. Rocks exclusively red, as at Dawlish.

2nd. Interstratified red and light-coloured, or Variegated beds, as at the Corbons in Torbay.

3rd. Blotched beds, in which the prevalent red is, for a limited extent, exchanged for light colours, as near Paignton harbour.

4th. Red Conglomerates containing yellow or drab spheres surrounding *mechanical* nuclei, as at Livermead Head.

5th. Mottled Red Marls containing greenish spheres and specks, some of the former surrounding *chemical* nuclei, as near Exmouth.

It must not be supposed that the rocky fragments in the Conglomerate are in themselves red, the colour of the bed is due to that of the paste in which the stones are imbedded, and to a film of the same hue with which they are coated, which can, in most cases, be very readily removed by washing. Indeed the *Sandstones*, when broken down into sand, give off a great amount of mere colouring matter, though they still retain the same hue.

That the red colour is essentially due to peroxide of iron there is no doubt; it is not easy, however, to account for its presence, for it must be remembered that it is by no means a local phenomenon since the red colours of the Trias have a wide geographical range. Sir Charles Lyell, when treating of this question, says "To account for deposits of red mud and red sand, we have simply to suppose the disintegration of ordinary crystalline or metamorphic schists. Thus, in the eastern Grampians of Scotland, in the north of Forfarshire, for example, the mountains of gneiss, mica-schist, and clay slate are overspread with alluvium, derived from the disintegration of those rocks; and the mass of detritus is stained by oxide of iron, of precisely the same colour as the Old Red Sandstone of the adjoining Lowlands. Now this alluvium merely requires to be swept down to the sea, or into a lake, to form strata of red sandstone and red marl precisely like the mass of the 'Old Red' or 'New Red' systems of England."* In order that this may furnish a solution of the problem, we must suppose micaceous or hornblendic rocks to have been as widely distributed as the Triassic deposits, or that the red rocks mark the direction of an oceanic current, of the age of the Trias, by which the pigment was transported and distributed from some extensive area or areas of decomposition or disintegration.

Nor does it appear that this would meet all the difficulties. That the prevalence of red colours has not been confined to merely one period of the Earth's history is manifested by the convenient and necessary terms "Old" and "New Red Sandstone"; nor are we without evidence of the recurrence of the same hue in much more modern times. Sir C. Lyell, speaking of the Upper Eocene strata of Auvergne, says "The most remarkable of the arenaceous groups is one of red sandstone and red marl which are identical in all their mineral characters with the secondary *New Red sandstone* and marl of England. In these secondary rocks the red ground is sometimes variegated with light greenish spots, and the same may be seen in the tertiary formation of freshwater origin, at Coudes, on the Allier."† Hence the problem becomes threefold:—1st. The wide geographical distributions of the red colour. 2nd. Its suspension during long intervals of time. 3rd. Its recurrence. I confess I am not satisfied with any hypothesis yet proposed on the subject.

Confining ourselves, however, to the rocks immediately under notice, two questions present themselves:

1st. When did the deposit receive its prevalent colour?

2nd. How were the exceptional colours produced?

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* "Manual of Elementary Geology," 5th ed., page 344.

† "Manual of Elementary Geology," 5th ed., page 199.

Two replies have been given to the first question. According to one of these, the beds, when neither "blotched" or "mottled," received the colours they possess at the time of their deposition; whilst the other supposes the colour to have been produced, subsequently to that period, by the chemical action of infiltered matter. The first reply appears to commend itself on several accounts. It is difficult to conceive of any infiltered matter selecting and rejecting successive and alternate beds of Sandstone, apparently identical in everything but their hue, as must certainly have been the case, on the second hypothesis, at the Corbons Head and elsewhere. I have in my collection a nodule of sandstone, having the "variegated" character most distinctly marked, which I extracted from a bed of purplish red conglomerate at Roundham Head, Torbay; that is to say, a fragment of variegated *Triassic* sandstone in a bed of *Triassic* conglomerate; from which it seems safe to infer that some of the sandstone beds had been formed and coloured long before the formation of the conglomerate in which I found the specimen; that is, they were coloured at an early part of the *Lower Triassic Age.*

It has been already stated that no fossils have been found in the red rocks of our county. Grant that the sea of deposition was surcharged with the red oxide of iron—a substance known to be inimical to animal life—and the absence of fossils is simply a consequence of the absence of animal life within the South Devon area during the Triassic period; but this granted, the proposition that the rocks received their colour when they were deposited will be at once admitted; whilst if it be not granted, we have no reason to suppose that animals—which lived in great abundance in other Triassic areas—did not live also within seas of what is now Devonshire, and no reason, so far as we know, why the rocks should be everywhere entirely destitute of their exuviæ, since we cannot suppose that a change in the colour would obliterate every trace of organic remains.

The exceptional colours present many difficulties. The "blotched" beds seem to indicate the discharge of the prevalent hue by chemical action of some kind. Mr. W. Vicary has recently called my attention to a paper, by J. W. Dawson, Esq., on "the Colouring Matter of Red Sandstones, and of Greyish and White Beds associated with them." His observations primarily apply to certain "red" rocks in Nova Scotia, but have a general application. He attributes the red colour to the peroxide of iron, and assigns reasons for believing it to have been rather a chemical precipitate than a substance triturated mechanically. He thinks that in many cases the grey, dark, and white beds, interstratified with those of a red hue, were, without doubt, originally uncoloured, but that "there are other instances in which they appear to have consisted of red sediment deprived of its colour by chemical agents after its deposition;" and adds "This may be effected by the agency of organic matter in two ways, the first of which applies more especially to marine, the second to freshwater deposits."

"The first consists in the conversion of oxide of iron" (in the sediment) into sulphuret of the metal. My attention was first directed to this process by observing it actually in progress in the harbour of Pictou. This harbour receives the water of three rivers and several smaller streams, which in times of flood carry into it large quantities of reddish mud, which sometimes discolours the whole surface. This mud, with similar sediment from the shores of the harbour, is deposited on the bottom, and there undergoes a remarkable change of colour. A portion of old mud recently taken from the bottom is of a dark grey colour, and emits a strong smell of sulphuretted hydrogen. When dried it loses this odour, and its colour is a pure grey without any trace of red. If a piece of the dried mud be heated to incipient redness, it emits a sulphurous odour, and at once assumes the red colour which belonged to the sediment before it was deposited. It thus appears that the iron of the red clay has entered into combination with sulphur, and this is probably obtained from the sulphate contained in the sea water, by the deoxidizing influence of decaying vegetable matter, the greater part of which seems to be furnished by the eel grass *(Zostera marina)*, which grows abundantly on the mud flats. It is evident that this modern deposit is quite analogous to many grey beds of antiquity, in which sulphuret of iron is mixed with organic matter, and there can be little danger in inferring that the causes in both cases are the same. I may mention, that in some parts of the deposit forming in Pictou harbour, the vegetable matter which has caused the change of colour is so completely decomposed that no visible fragment of it remains.

"Another modern cause of the change of colour in red sands and clays is the action of acids, produced in the putrefaction and decay of moist vegetable matter. This is the usual cause of the whiteness of the subsoils of peat bogs and swamps, and in such places the oxide of iron is often re-deposited at the outlet where the surplus water escapes from the bog. This process also probably prevailed extensively in the freshwater deposits of former periods, and may have changed the colours of clay and sands, and have collected their colouring matter in bands and nodules of carbonate and hydrous peroxide of iron. Beds bleached in this way of course do not resume their colour when heated."*

In the conclusion of the paper the author draws some interesting inferences of a general nature, and states his belief that "the occurrence of grey beds and patches in red formations may often indicate the former existence of fossils whose forms have perished."

It can scarcely be doubted, that the origin of the yellowish spheres of the Conglomerates is in some way connected with the stony nuclei which they invariably contain; it is difficult, however, to understand in what way the latter have been operative, since, 1st. The stones are fragments of different kinds of rocks. 2nd. In no locality is every stone, whether of limestone or trap, found to be thus surrounded. 3rd. In some localities every stone is free from any such investment. 4th. The nuclei appear to have undergone no change of any kind since their inhumation. 5th. If they have, by a direct centrifugal force, discharged the red colour, or, by a centripetal force, segregated the light-coloured and previously widely-distributed matter around them, or matter which has expelled the colour in any way, this force can have borne no fixed or constant relation to the mass of the nucleus, since spheres of the same size contain nuclei which differ much in dimensions, and conversely.

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* "Quart. Journ. Geol. Soc.," vol. v, page 25, &c.

In the Marls, however, the presence of stony, or, indeed, of any nuclei cannot be essential, as by far the greater number of the greenish spheres appear to be destitute of them, and *stones* are never found. Most of the nuclei which present themselves contain indications of sulphur. Do these spheres "indicate," as Mr. Dawson suggests "the former existence of fossils whose forms have perished?"

I have dwelt thus long on the colours of the so-called Red rocks, in the hope that such of the members as have given attention to cognate questions—and I am happy to see several of my chemical friends present—may, at least, furnish some hints towards a solution of the problems which the phenomena suggest.

Joints are numerous, and Faults are by no means rare. Excepting those at Tor-Abbey Sands and immediately north of Babbacombe —figured and described in my last lecture*—and such as may, perhaps, exist in the more important valleys—which I do not now intend to discuss,—the faults are not generally of much importance. Those which I have observed between Dawlish and the Exe throw the country down towards the latter, that is, in the direction of the inclination of the strata; and would, therefore, enhance any estimate of the thickness of the formation, based on the amount of the Dip and the extent of the section in its direction. On the other hand, the Triassic faults in the Torbay cliffs are in the opposite direction.

As might be expected in a country where faults frequently occur, there are variations, in different parts of the district, in the *amount* and *direction* of the Dip, as will be seen in the following Table. The measurements have been taken with considerable care and in the following manner: when working in the field, I take with me a piece of school slate upwards of a foot in length and three or four inches wide; this I lay on the surface of the bed so as fairly to represent its slope, and then gently pour a little water on its elevated end; the direction in which this flows renders it easy, with clinometer and compass, to obtain reliable measurements of the amount and direction of the inclination.

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* "Transactions," 1861—2, page 26, &c., fig 3

LOCALITIES.	DIP.	
	AMOUNT.	DIRECTION.
Saltern Cove..........................	17°	N. 60° E. (Mag.)
Goodrington Sands (South).........	11	30
,, ,, (North).........	11	85
Roundham Head	11	37
Paignton Harbour	11	45
Preston Sands	7	84
Hollacombe (South)	7	101
,, (North)	7	90
Livermead Head	4	63
Corbons	8	113
Oddicombe	37	45
Petitor	12	83
Watcombe (South)	37	38
,, (North)	27	25
Between Watcombe & Maidencombe	18	24
,, ,, ,,	22	25
,, ,, ,,	24	45
,, ,, ,,	16	30
,, ,, ,,	15	33
Maidencombe (South)	11	25
,, (North)	4	45
Ness Point (South of Teign)	5	129
Teignmouth Bridge (North of Teign)	15	97
Between Teignmouth and Dawlish .	35	71
,, ,, ,,	25	90
,, ,, ,,	13	77
,, ,, ,,	25	90
Dawlish (South)	16	75
,, (North)	12	80
Between Dawlish and Langstone Pt.	15	85
,, ,, ,,	16	90
Langstone Point (South of Exe) ...	17	80
Exmouth Plantation (North of Exe)	5	110
Between Exmouth and Flat Point .	10	120
Means	15½°	N. 68° E.

The words "(North)" and "(South)" are intended to show on which side of a valley the measurements were taken, thus, there are two entries for Hollacombe, in Torbay, one on the south, the other on the north of the narrow gorge existing there; the object being to show whether or not there are indications of a "Fault" in the valley.

The "directions" are entered in degrees, and always from north towards south, through east; the latter being entered as N. 90° E., whilst south, had it occurred, would have been set down as N. 180° E., and so on. This mode has been adopted in order to facilitate comparison, as well as the calculation of the *Mean.*

In no instance is the inclination very considerable, the greatest being 37°. The *Means* of the amount and direction of the dip are about 15½° towards N. 68° E. (mag.), or N. 44½° E. true; that is very nearly the direction of the Flat Point from Goodrington Sands, a distance of about 15 miles.

Now the tangent of 15½° is ·2773, so that were we to calculate the thickness of that portion of the formation which we have been considering, from its dip and horizontal extension in the direction of inclination, it would amount to fully four miles. That this result is vastly beyond the truth there can be no doubt, nevertheless, it serves to show that the red rocks of Devonshire contain an enormous amount of detrital matter.

Much of the Conglomerate material is extremely angular, and the general character is that of sub-angularity; so that the beds are more correctly *Breccias* than *Conglomerates.* Many of the fragments, as has been already stated, were derived from the older rocks in the immediate neighbourhood, and the angularity is probably a consequence of this fact; others, on the contrary, have certainly travelled considerable distances, such as the fragments of trap and carbonaceous rock, both of which, probably, came from the district west of the line extending from Haldon to Exeter, and their angularity is difficult to account for; it is on the whole, however, characteristic of the stratified, rather than of the igneous, detritus.

Again, the trappean masses are not unfrequently of great size. The largest probably occur near the mouth of the Teign especially in the cliff between Shaldon and the Ness Point. They are more or less ellipsoidal in form, and sometimes measure fully five feet in greatest diameter.

That the same somewhat distant district has sent down blocks of rock, very many of which have preserved their angularity and others their great volume, are facts which cannot but claim attention; more especially as they have suggested to some geologists a transportation by the agency of ice. Though I do not believe that the time has arrived when it would be possible to write the thermal history of the earth, and though I have no *a priori* objection to the existence of ice in our latitudes in Triassic times, inasmuch as I cannot, in the present state of the evidence, subscribe to the doctrine that the temperature of the earth was higher than at present in ***all*** pre-"Glacial" times; nevertheless, there does not appear to be any necessity to call in the agency of ice to account for the phenomena just mentioned.

It is no doubt true that the materials are in no way sorted—coarse and fine, heavy and light being mingled together,—yet they were certainly *arranged* by the action of water, since they are most distinctly stratified, and the pebbles lie with their longest axes parallel to the planes of bedding. The aggregation, however, does not appear to be such as would have resulted from the action of a stream or current, it rather indicates the agency of waves on an open beach.

The blocks or boulders, moreover, large as they certainly are, are probably not beyond the transporting power of water, especially when it is remembered that the specific gravity of rock in general is to that of water about as 5 to 2; so that stony materials retain in water no more than three-fifths of their weight in air.

The power of waves to remove huge blocks was strikingly displayed in Torbay during the too fatal gale of October 26th, 1859,—sometimes termed "The Royal Charter Storm." Amongst other damage, it almost completely destroyed the turnpike road between Torquay and the railway station; this road was protected by a sea-wall having a parapet the base of which was about six feet above the level of still-weather spring-tide high-water. In one place a portion of this parapet, nine feet long by three in breadth and depth, and therefore measuring 81 cubic feet, was removed *en masse* 25 feet horizontally, landward, across the road; where it was found, inverted, after the storm. By careful experiments I found that a portion of this mass weighing 99½ ounces av. displaced 71 cubic inches of water, consequently the entire block thus transported must have weighed about five and a half tons.

The carbonaceous rocks which furnished the travelled though angular fragments have a strong tendency to divide into rhombohedral masses in consequence of joints, which are sometimes imperceptible; and this tendency is retained by the carbonaceous materials of the conglomerate. I have in several instances extracted stones of this kind which, on being accidentally dropped, have resolved themselves into angular pieces; hence it appears not improbable that considerable blocks might have been successively divided, during the journey, into smaller and smaller fragments, each division restoring the angularity which is usually characteristic of untravelled stones.

The phenomenon known to geologists as *False* or *Diagonal Stratification* is very common, and sometimes, though rarely, occurs in the finer Conglomerates. A good example of the latter formerly existed at Livermead and extended along a considerable line of cliff. The rapid encroachments of the sea there has rendered a sea-wall necessary, so that it is no longer visible. As may be expected, however, the most striking instances occur in the Sandstones. Amongst other note-worthy cases I may mention those in the outlier at Slapton, (see Fig. 2), in the north cliff at Goodrington Sands, (Fig 1), in a road-cutting between Exeter and Woodbury, and at

Dawlish; the last locality furnishes numerous and probably the most striking examples in the district. An extremely fine case occurs on the South Devon Railway, in the cliff between the two tunnels next south of Dawlish.

There can be no doubt that "false stratification" was caused by the action of water moving with slight velocity in the direction in which the stratula* (false strata) dip, and which transported the materials having the arrangement in question. The probable mode of operation may be thus illustrated: Suppose a party of navvies employed to extend the road *a.* (fig. 3) over the low ground *b.* They wheel out the ballast in their barrows and throw it over the scarp *a.*, the slope which the talus will assume will depend principally on the force with which the material is shot out, and on the specific gravity and form of the fragments. The inclination will be small or great according as the force is great or small, and according as the materials are light or heavy; angular fragments, when not merely plates such as slate fragments, will be more favourable to a steep talus than those having a rounded form. Other conditions no doubt belong to the problem, but those noticed are sufficient for our purpose. When completed, a longitudinal vertical section through the road would disclose false stratification (the successive taluses), and would indicate not merely the direction of transportation, but, the materials being the same, would show, by the variations in the inclination, the changes in the strength exerted by the workmen. The upper surface of the completed embankment would form a true plane of stratification, and on this another such bed might be built which would display the same phenomenon if built in the same manner, and the *dip* of the stratula would be in the same or the opposite direction as in the bed below according as the labourers worked from *a.* to *b.*, as in the first case, or the reverse.

Now, if for the "force of the navvies," we substitute the "transporting power of running water," we convert our ***illustration*** into the veritable process by which diagonal stratification was produced, and on applying the principle to fig. 2—the Slapton case —we learn that the bed *d.* was formed of fine sand transported in the direction *b. a.*, whilst the stratum *e.* was built of similar material which travelled from *a.* towards *b.*; the direction of the water-flow having changed before the commencement of the upper bed.

The history of the section at Goodrington Sands (fig. 1.), is more involved, but, if I interpret the appearances correctly, a bed of sand, of which *b. c. f.* is a relic, had been deposited by water flowing towards N. 70° W. (mag.), and which threw down stratula inclined to the plane of the horizon at an angle of 31°=21° (dip of false stratification) + 10° (dip of true stratification in the opposite direction). Subsequently much of this bed was destroyed, it being cut down to the level of *f.*—which it only retained, however, farther west than the point so marked—and to a still lower level further eastward. On the surface thus planed off, and of which *c. f.* is a portion, water moving towards the opposite direction, S. 70° E. (mag.), deposited similar material in stratula inclined at an angle of 13°=23° (dip of stratula)—10° (dip of true stratification). On the completion of this, denudation again set in and produced an even sloping surface *b. f. e.*, the slope, in fact, of the original stratula. This effected, the water flowed again towards N. 70° W., and diagonal stratification, agreeing in amount and direction of dip with that first formed, was produced in the matter which it deposited. It is assumed in the foregoing explanation that the planes of stratification were originally horizontal.

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* This convenient term was, I believed, first used by Mr. H. C. Sorby.

There can be no doubt that the operations just described absorbed a considerable amount of time, but it would appear that the various changes succeeded one another without considerable intervals or periods of intermittence, inasmuch as the sand seems to have remained incoherent throughout the whole, since the lines *c. f.* and *b f. e.* are not more strongly marked than those which separate contiguous and conformable stratula.

My friend Mr. Sorby exhibited to the Geological Section of the British Association, during the meeting at Cheltenham, in 1856, a "Working Model," which he had recently invented for the purpose of illustrating the phenomenon now under notice. The following is his description of the instrument. "In the model, the drifting effect of the current is intimated by a kind of coarse screw, which, when turned round, carried forward the sand, supplied from a bag, along a groove, from which it fell into a space with a glass front, where it accumulated at the angle of rest. Being a mixture of heavy black fine grains of specular iron and coarser white quartz sand, it became sorted by moving the screw alternately quickly and slowly, and thus accumulated in black and white bands; whereas if it was moved with a uniform velocity no such bands were produced, but the coarse white particles collected at the bottom."*

There are certain remarkable appearances in the coarser Sandstones and very fine Conglomerates at Watcombe of which I can give no explanation, and which I fear it may be difficult to describe. In ordinary and unaltered sandstone the grains, or, more correctly, scales or plates of sandy matter are unequiaxed, and, as might be expected, lie with their shortest axes at right angles to the plane of sedimentation, so that their inclination to the horizon is the same as that of the bed or layer which they compose; hence in either a longitudinal or transverse vertical section they would appear as in fig. 4. Now, if each plate be permanently raised at one margin only, for example that nearest *a.* in each, a longitudinal vertical section through undisturbed as well as disturbed plates would present the appearance shown in fig. 5; so that the re-arranged plates would project somewhat above the general surface. If, instead of the plates in a single linear series, those composing several contiguous and parallel lines in both a horizontal and a vertical direction, in other words all the plates within a limited and pretty constant breadth and depth and for a length of several inches, were thus permanently raised, and if, further, the transverse lines of plates in each horizontal section were curves, symmetrical with respect to each other and also with respect to the margins of the re-arranged area, as in fig. 6, the result would be very much such as the phenomenon I speak of. In fact the plates of sandy matter appear to have bristled up, here and there, in small sub-cylindrical masses. The coarser the material in which it occurs, the more obvious is the phenomenon, and this simply because the plates being larger and stronger, stand up in bolder relief.

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* Report Brit. Assoc., 1856, page 77.

From the description just given it may probably be inferred that their axes invariably lie in the plane of sedimentation; this however is by no means the fact, for they are sometimes found passing vertically, as well as at various degrees of obliquity, through the bed. Though commonly rectilineal they sometimes take a curvilineal direction; nor are they always, even approximately, cylindrical, a transverse section being occasionally elliptical, and their outlines both curved and conical. Such instances, however, appear to be exceptional.

They vary much in dimensions; some examples being not more than a quarter of an inch in the transverse section, whilst others measure as much as three inches. In length they sometimes exceed a foot.

In a few rare cases I have succeeded in drawing portions of them, three inches long, out of the rock in the form of cylinders; as if they were casts of cylindrical tubes or galleries.

Sometimes several appear to radiate from a centre, and not unfrequently they cross one another and thus produce a rude reticulation on the surface of the rock.

I can venture on no opinion as to their origin. They sometimes suggest the idea of the trails of marine invertebrata, but this could only apply, if at all, to those lying in the plane of sedimentation; on other occasions I have been led to think them casts of the borings of animals in the sand. Should either of these guesses prove to be correct, they would give a special interest to the objects as the only indications of organic existence yet found in the Red rocks of Devonshire.

With the exception of certain, possibly, allied appearances in the

Sandstones east of Exmouth, nothing of the kind has been met with, so far as I am aware, except at Watcombe, where they are numerous.

Except where interstratified Sandstones occur, it is commonly very difficult to resolve the Marl into anything like regular beds. It presents itself under the most fragmentary aspect, and suggests the thought that it has undergone considerable shrinkage, for the entire cliff sometimes appears to be built up of rudely ellipsoidal nodules, from the size of hazel nuts to masses upwards of a foot in diameter. The dislodgement of one of these generally brings down a large number which almost invariably exfoliate, giving off shell after shell each of which breaks into angular pieces. Though denominated *Marl* it does not contain much carbonate of lime, nor is it frequently entirely destitute of this substance.

In my last lecture I stated that a doubt existed respecting the place of the Red Rocks of Devonshire in the chronological series of the geologist, and endeavoured, from new data, to prove that they belonged to the age of the Lower Trias, commonly termed the Bunter. A part only of the doubt was then removed; that is to say the question has been put "Do the Marls beyond the mouth of the Exe belong to the same period, or subdivision of period, as the Conglomerates and Sandstones south of the same river?" To this question, which has been recently pressed on my attention by Sir R. I. Murchison, I hope a reply can now be given.

Marl—though certainly in sparing quantities—is found interstratified with the two other classes of rocks throughout the district south of the Exe. A well-marked bed occurs in the north cliff at Goodrington Sands, Torbay (see *h.* fig 1.); that is, excepting the outliers, the southern verge of the formation. It occurs, also, near Paignton Harbour, at the Corbons, at Dawlish and elsewhere; and is everywhere characterized by the tendency—already mentioned—to break into rudely ellipsoidal nodules. Moreover, much of the paste of the Conglomerate is a mixture of Sand and Marl, and this is the case in a marked degree between the Teign and Exe, that is with increased proximity to the true Marl district. Add to this the fact that the Conglomerates on each bank of the Exe—at Langstone Point and at Exmouth—consist of much finer material than further south, and we have a sort of prediction of the coming change—the withdrawal of all detritus large enough to be called stones, and the surrender, to Sand and Marl exclusively, of the new area into which the deposits were to be carried.

The most conclusive evidence on the point, however, occurs in the Undercliff, known as the "Plantation," below, and east of Beacon Terrace, at Exmouth; where the Marl is found lying conformably on the Conglomerate, the upper surface of the latter presenting nothing like denudational inequalities, nothing, in fact, to mark non-sequent succession; no indication whatever of an interval of time unrepresented by sedimentation. Owing to a luxuriant undergrowth, the section is small and not so well exposed as could be desired; it is unfortunate, therefore, that for a considerable distance east of the "Plantation" the entire country is masked by blown-sand. On passing beyond this, however, the Marl and Sandstone are found to be in possession of the entire cliff, where they give confirmatory evidence of the correctness of the opinion now advocated; since their *Dip* agrees, both in amount and direction, with that of the Conglomerates in the "Plantation," being, in each case, about from 5° to 10° towards S. 20° to 30° E. (mag). The Dip and distance fully account for the disappearance of the Conglomerate in the eastern district without calling in the aid of a hypothetical "fault," more especially as the cliff is low on the west, but lofty on the east of the blown-sand. I have no doubt, therefore, that all the Red Rocks extending from Torbay to the Flat Point (the limits within which I at present restrict myself) belong to one and the same period, namely the Bunter, or Lower Trias.

I have no reasons to suppose that this does not apply also to the red beds still farther eastward.

The Red Cliffs waste rapidly: their enemies being Waves, Springs, and Atmosphere.

The northern and southern shores—the extremities—of Torbay consist of hard *Devonian* rocks, chiefly limestone, the central cliffs alone being Trias; and, as the bay is deep and comparatively narrow, the waves can only attack the red cliffs in front, that is at right angles to their line of direction; hence their destruction is effected by the formation of a series of small holes or cavities, which are gradually enlarged into good examples of Caverns of Abrasion; two or more of these ultimately break into one, and this process goes on until the weight of the superincumbent mass becomes so great and the bases so incompetent, that the whole structure gives way and exposes a new cliff to a repetition of the process. About Dawlish, on the contrary, the long line of Red cliffs is more exposed, and waves assail them from every direction; hence Caverns are less numerous, but insular portions or crags are the results of the modification of the operation, and are so many relics of an ancient coast line. No such fragmentary masses occur in Torbay.

Landslips—sometimes on a great scale—are common, especially in the Marl; and appear to be caused by springs. Beautiful examples of *Slickensides* occasionally occur in the fallen matter. Watcombe, near Torquay, and other unusually romantic Red Sandstone districts are probably attributable to ancient landslips.

Though the results of "*weathering*" are much less conspicuous and striking than those of waves and springs, the denudation effected thereby must be considerable. When composed of fine sandstone without "Iron pan," the cliffs, especially when vertical, are lined with plates of sand, which vary in thickness from an inch, or more, to films not thicker than writing paper, and may be compared to loose plaster or pellicles of whitewash on a wall. Even the films sometimes cover considerable areas, and may be described as being built up of a series of superposed rows or lines of sand a single grain in thickness, each row representing, and having been detached from, a distinct and separate lamina of sedimentation. The plates, whether thick or thin, are parallel to the cliff, and, therefore, at least, sensibly vertical. They are not coincident with, or parallel to, any recognizable divisional surface of the rock, whether of true or false stratification or of jointage, but are not unfrequently at right, and other high angles to them; their appearance may be illustrated however by speaking of them as having been produced by Atmospheric agents which have detected and developed a latent cleavage in the rock; or by supposing that of the forces which formerly held the particles together, two only—those in the directions of the length and height of the plate—had been faithful to their trust; the third—that in the direction of the thickness of the plate—having allowed them to be detached. On carefully removing a portion of one of the films it is found to divide along the lines of sedimentation. It seems not improbable that the separation may have arisen from the atmospheric moisture, absorbed by the sandstone, penetrating to a limited and uniform depth, where, by its gravity, or by changes of volume in consequence of changes of temperature, or both, it overcame the cohesive force which held the particles together.

And now, though my notes are by no means exhausted, my time is more than gone. I cannot on this occasion enter on a consideration of the numerous facts which testify to the vast chronological value of the Triassic rocks of Devonshire, nor must I indulge in the pleasure of speaking of the Life History of the period which they represent. Though our Red rocks appear to be destitute of fossils, their era was by no means a lifeless one; possibly it may have been less rich than some others in the amount and variety of its organic forms, though this idea must be understood rather as the exponent of our ignorance, than of our knowledge, of the Flora and Fauna of this, the earliest, Chapter of the Mesozoic volume of the Earth's history. We must not forget that rocks largely charged with peroxide of iron are usually very poor in fossils, nor that the St. Cassian beds, in the Austrian Alps,—believed to belong to the Trias—have somewhat recently yielded as many as 800 species of fossils.

EXPLANATION OF THE FIGURES.

Fig 1 is a section showing the succession of the Triassic rocks in the north cliff of Goodrington Sands, Torbay. It is drawn on the scale of one inch to ten feet. Its height is 75 feet, breadth 40 feet, and its direction from N. 70° W. to S. 70° E. (mag.), or true west and east nearly.

b. c. is the base of the cliff.

b. c. d. g. is a bed of sandstone showing diagonal stratification, indicated by the lines *b. e.* and *c. f.* and those parallel to them respectively. The Dip of the beds, so far as it can be ascertained, is shown by the line *g. d.* and those parallel to it, and measures 10° towards S. 70° E. (mag.) Unless, however, the direction of the cliff section is identical with that of the Dip, which is by no means probable, this cannot be the true Dip.

The stratula parallel to *c. f.* composing the mass *c. d. e. f.*, dip 23° towards S. 70° E. This mass is continued much further in the direction *a. d.* The remainder of the bed is made of stratula parallel to *e. f. b.*, which dip 21° towards N. 70° W., and are continued much beyond *b. g.* The stratula are as thin as paper.

i. is a bed of Sandstone, 5 inches thick, without diagonal stratification.

h. is a bed of Marl 18 inches thick.

k. is a bed of Sandstone with diagonal stratification, the stratula being somewhat less inclined than *e. b.*, &c.

l. is a bed of fine Conglomerate.

m. n. o. p. beds of Sandstone, in all respects similar to *k.*

n. p. q. o. beds of rather coarse Conglomerate.

b. n. is 41 feet and *n. p.* is 34 feet.

Fig 2. is a section of Sandstone in the Triassic outlier at Slapton in Start Bay. It is drawn on the scale of one inch to two feet.

The lines *a. b.* show the dip of the beds, which measures 2° towards N. 45° E. (mag.)

The stratula in the beds *c.* and *f.* are parallel to the plane of stratification, in *d.* they dip 27° towards S. 45° W. and in *e.* 24° towards N. 45° E., *d.* is 30 inches in thickness, *e.* 24 inches.

Fig 3 is intended to illustrate "False Stratifications." (See page 32), and 4, 5, 6, to aid in the description of the phenomena observed at Watcombe. (See page 33, &c.)

Fig: 1.

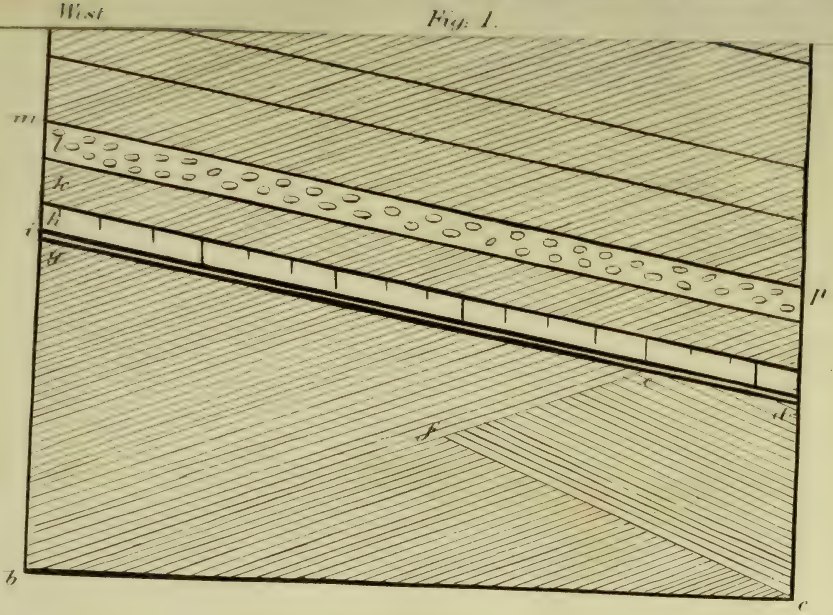
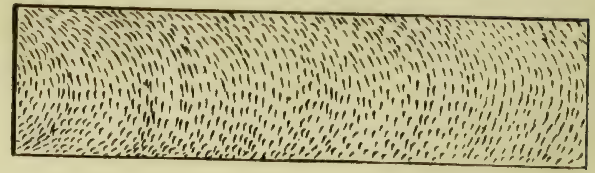


Fig: 4

Fig: 5.

Fig: 6.



Trans. Plym. Inst. & Devon & Corn. Nat. Hist. Soc. 1863.

Fig: 1.

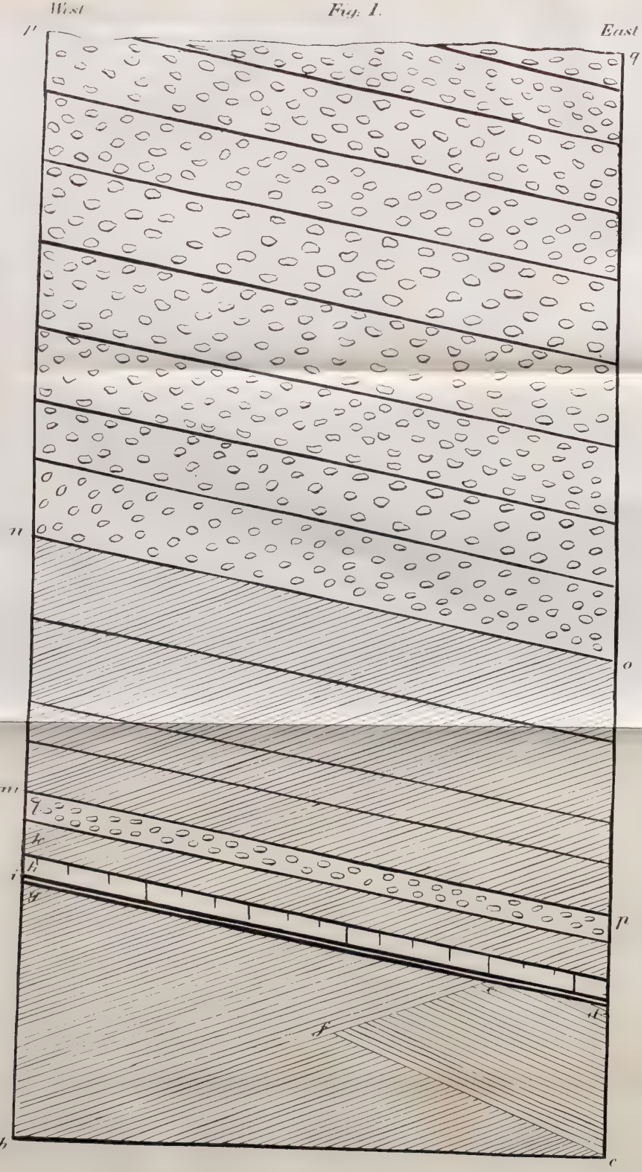


Fig: 2

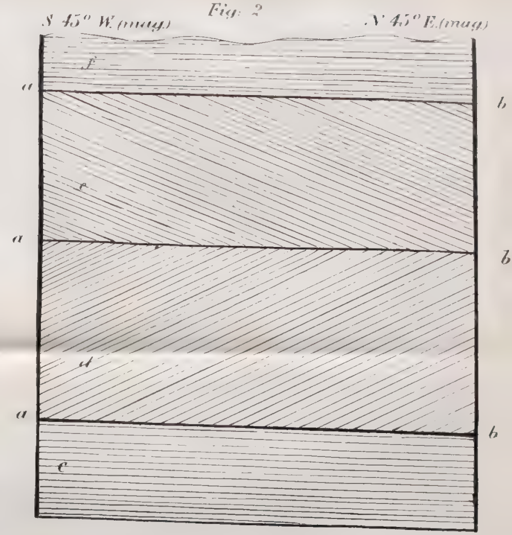


Fig: 3

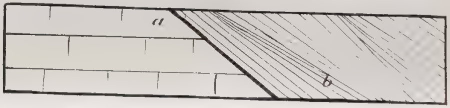
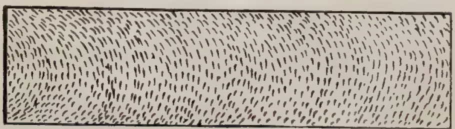


Fig: 4

Fig: 5.

Fig: 6.



A CATALOGUE

OF

THE MAMMALS, BIRDS, REPTILES, AND AMPHIBIANS OF DEVON.

BY J. BROOKING ROWE, F.L.S.,

Honorary Secretary of the Plymouth Institution, and Devon and Cornwall Natural History Society.

THE following contributions to the History of the Fauna of Devon are intended to serve only as catalogues of some of our indigenous animals: no one knows their imperfections better than their author, and any information with regard to their respective subjects will be gladly received by him.

Princess Square, Plymouth, June, 1863.

INTRODUCTION TO MAMMALS.

In the synonymy of the following list the works of English authors only have been used, as being readily accessible for reference. The scientific names have been taken from the most recently published English authority,—Lord Clermont's "Quadrupeds and Reptiles of Europe."

The Bats and Cetaceans require much investigation; and with regard to the latter very little information is attainable, beyond that collected by Mr. J. C. Bellamy, which will be found in his "Natural History of South Devon,"—a work in many respects of much value.

To W. S. M. D'Urban, Esq., best thanks are due for the valuable assistance rendered with respect to species found in the neighbourhood of Exeter.

The works referred to are the following:—

"A Manual of British Vertebrate Animals," by Rev. Leonard Jenyns, M.A. 8vo., 1835. [Jenyns, Brit. Vert.]

"A History of British Quadrupeds," by Thomas Bell, F.R.S. 8vo., 1839. [Bell, Brit. Quad.]

"A Guide to the Quadrupeds and Reptiles of Europe," by Lord Clermont. 12mo., 1859. [Clermont, Quad. Europe.]

The author will be glad to receive for examination any specimens of Mammalia, more especially of the Bats, Shrews, and Voles, which his readers may meet with.

THE MAMMALS OF DEVON.

MAMMALIA.

ORDER—CHEIROPTERA.

Gen. **RHINOLOPHUS,** *Geoffroy.*

R. Ferrum—Equinum, *Great Horse-Shoe Bat.*

R. Ferrum equinum, Bell, Brit. Quad., p. 68. Clermont, Quad. Europe, p. 4. Jenyns, Brit. Vert., p. 19.

Has only been observed in South Devon. Torbay, *Montagu;* Hooe, *Bellamy;* Plymouth, *J. B. R.*

R. Bihastatus, *Lesser Horse-Shoe Bat.*

R. hipposideros, Bell, Brit. Quad., p. 73.
R. bihastatus, Clermont, Quad. Europe, p. 5. Jenyns, Brit. Vert, p. 20.

Like the former species, has only occurred in the South of the county, and in almost the same localities, but is more rare. At Torbay both were found in company, by Montagu. A specimen was taken at Plymouth, I believe for the first time, in April last, in a cave under the Hoe, by Master Maguire Bate, who, not knowing the species, kept it alive for some days and sent it me after its death.

Gen. **VESPERTILIO,** *Linn.*

V. Noctula, *Great Bat.*

V. noctula, Bell, Brit. Quad., p. 12. Clermont, Quad. Europe, p. 8. Jenyns, Brit. Vert., p. 23.

Common throughout the county. Last year (1862) very scarce in the neighbourhood of Exeter, but the reverse was the case round Plymouth. Appears about the beginning of May; sometimes rather earlier, as was the case this year, and is found throughout the summer, and until late in the autumn. "Has two large glands in the mouth which emit a very rank odour. Feeds on Cockchafers (*M. vulgaris*) in May and then flies low; at other times flies very high, and feeds on small coleoptera,"—*W. S. M. D'Urban.*

It is our largest species, measuring in expanse of wings generally sixteen inches.

V. Pipistrellus. *Pipistrelle.*

V. pipistrellus, Bell Brit. Quad., p. 23. Clermont, Quad. Europe, p. 15. Jenyns, Brit. Vert., p. 24.

Very common throughout the county. "Usually comes abroad in March, about the time that the spring Noctuidœ appear at Sallow blossoms, and may be seen picking these Moths from off the blossoms as it flies past."—*W. S. M. D'Urban.* The *Pygmy Bat, V. pygmœus*, of Leach, is a small individual of this species, *vide Blasius: Wirbelthiere Deutschlands, p.* 61.

V. Auritus, *Long-eared Bat.*

Plecotus auritus, Bell, Brit. Quad., p. 53.
V. auritus, Clermont, Quad. Europe, p. 33. Jenyns, Brit. Vert., p. 27.

Frequent in all parts of the county, but not so much so in the north and centre of the county as in the south. Appears very early in the year and continues its flight until late in the autumn. In 1852 Mr. D'Urban observed it so late as November.

V. Barbastellus. *Barbastelle.*

Barbastellus Daubeutonii, Bell, Brit. Quad., p. 63.
V. barbastellus, Clermont, Quad. Europe, p. 35. Jenyns, Brit. Vert., p. 28.

Until recently, this species seems to have been lost sight of since Montagu's time. Within the last two or three years it has been taken in the neighbourhood of Plymouth by Mr. J. J. Reading, and I have procured specimens from an attic at Plympton. Kingsbridge, *Montagu;* Milton, *Montagu;* Exeter, *Mr. W. S. M. D'Urban;* Plymouth, *Mr. J. J. Reading;* Plympton, *J. B. R.*

V. Discolor, *Parti-coloured Bat.*

V. discolor, Bell, Brit. Quad., p. 21. Clermont, Quad. Europe, p. 14. Jenyns, Brit. Vert., p. 24.

Only one specimen has been taken in England, near Plymouth, by Dr. Leach, *vide Bell, Brit. Quad., p.* 21.

V. Mystacinus, *Whiskered Bat.*

V. mystacinus, Bell, Brit. Quad., p. 50. Clermont, Quad. Europe, p. 18. Jenyns, Brit. Vert., p. 26.

Montagu took some bats in Devonshire and sent them to the British Museum, marked *V. barbastellus.* Dr. Gray however examined the specimens and pronounced them to be of this species, *vide Bell's Brit. Quad., p.* 50.

ORDER—INSECTIVORA.

Gen. **SOREX,** *Linn.*

S. Tetragonurus, *Common Shrew.*

S. araneus, Bell, Brit. Quad., p. 109.
S. tetragonurus, Clermont, Quad. Europe, p. 37. Jenyns, Ann. & Mag. N. Hist.
S. araneus, Jenyns, Brit. Vert., p. 17.

Common and generally distributed.

S. Fodiens, *Water Shrew.*

S. Fodiens, Bell, Brit. Quad., p. 115. Clermont, Quad. Europe, p. 40. Jenyns, Brit. Vert., p. 18.

In the south of the county sparingly, and in the neighbourhood of Exeter. It was formerly supposed that the oared shrew *(S. remifer)* was distinct from this species, but Mr. R. F. Tomes (the best authority with regard to the smaller mammalia) informs me that it is only a permanent summer variety of the present species, *vide Blasius: Wirbelthiere Deutschlands, p.* 120.

The Pygmy Shrew *(S. pygmæus)* has been observed in England, but I have not met with it in this county.

Gen. **ERINACEUS,** *Linn.*

E. Europæus, *Hedgehog.*

E. Europæus, Bell, Brit. Quad., p. 76. Clermont, Quad. Europe, p. 46. Jenyns, Brit. Vert., p. 19.

Generally distributed and common.

Gen. **TALPA,** *Linn.*

T. Europœa, *Mole.*

T. vulgaris, Bell, Brit. Quad., p. 85.
T. europœa, Clermont, Quad. Europe, p. 48. Jenyns, Brit. Vert., p. 17.

Very common throughout the county. Varieties in colour often occur. I have observed four—light grey, brown, cream coloured and pure white.

ORDER—CARNIVORA.

Gen. **MELES,** *Cuv.*

M. Taxus, *Badger.*

M. taxus, Bell, Brit. Quad., p. 122. Clermont, Quad. Europe, p. 51. Jenyns, Brit. Vert., p. 10.

I have heard several times lately of the much persecuted Badger in the south of the county, at Wembury, Ivybridge, and other localities, and hope it may be increasing in numbers. Numerous on the borders of Dartmoor, about Manadon, Poltimore, Heavitree, and Honiton, *W. S. M. D'Urban.*

Gen. **MUSTELA,** *Linn.*

M. Vulgaris, *Weasel.*

M. vulgaris, Bell, Brit. Quad., p. 141. Clermont, Quad. Europe, p. 55. Jenyns, Brit. Vert., p. 12.

Common and generally distributed.

M. Erminea, *Ermine Weasel.*

M. erminea, Bell, Brit. Quad., p. 148. Clermont, Quad. Europe, p. 56. Jenyns, Brit. Vert., p. 13.

Not so common as the last species, and like it much persecuted. Has been taken on Dartmoor in the winter dress, nearly as white as when known as the Ermine of commerce.

M. Putorius, *Polecat.*

M. putorius, Bell, Brit. Quad., p. 156. Clermont, Quad. Europe, p. 53. Jenyns, Brit. Vert., p. 11.

Scarce. The last I heard of were two together, seen by a friend of mine in the woods near Harford, in the month of April last.

M. Foina, *Marten.*

Martes foina, Bell, Brit. Quad., p. 167.
Mustela foina, Clermont, Quad. Europe, p. 58. Jenyns, Brit. Vert., p. 11.

I know of no recent captures. My authority for inserting it in this list is Mr. J. C. Bellamy, who gives it as a Devon species as follows :—" Woods at Lydford and Buckland in the Moor."

M. Martes, *Pine Marten.*

Martes abietum, Bell, Brit. Quad., p. 174.
Mustela martes, Clermont, Quad. Europe, p. 58. Jenyns, Brit. Vert., p. 11.

My only authority for inserting this species here is the presence of a specimen in the Museum of the Plymouth Institution,—a part of the collection formed by the late Mr. Leach. Bellamy certainly says Buckland in the Moor, but the whole paragraph is inserted with a query prefixed.

Gen. LUTRA, *Cuv.*

L. Vulgaris, *Otter.*

L. vulgaris, Bell, Brit. Quad., p. 129. Clermont, Quad. Europe, p. 59. Jenyns, Brit. Vert., p. 13.

Common on all our rivers and sometimes around the coast.

Gen. CANIS, *Linn.*

C. Vulpes, *Fox.*

Vulpes vulgaris, Bell, Brit. Quad., p. 252.
Canis vulpes, Clermont, Quad. Europe, p. 62. Jenyns, Brit. Vert., p. 14.

The Fox only owes its existence to the sportsman; were fox hunting abolished, within five years we should not have one in the county.

Gen. PHOCA, *Linn.*

P. Vitulina, *Seal.*

P. vitulina, Bell, Brit. Quad., p. 263. Clermont, Quad. Europe, p. 73. Jenyns, Brit. Vert., p. 15.

Found on the north coast, but not to my knowledge on the south, although a specimen thrown dead upon the shore was noticed by Mr. J. J. Reading so near as Whitsand Bay a year or two since.

ORDER—RODENTIA.

Gen. **ARVICOLA,** Lacép.

A. Amphibius, *Water Vole.*

A. amphibius, Bell, Brit. Quad., p. 321. Clermont, Quad. Europe, p. 83.
A. amphibia, Jenyns, Brit. Vert., p. 33.

Common and generally distributed.

A. Arvalis, *Field Vole.*

A. arvicola, Bell, Brit. Quad., p. 325.
A. arvalis, Clermont, Quad. Europe, p. 90.
A. agrestis, Jenyns, Brit. Vert., p. 33.

Common and generally distributed.

A. Rubidus, *Bank Vole.*

A. pratensis, Bell, Brit. Quad., p. 330.
A. rubidus, Clermont, Quad. Europe, p. 91.
A. riparia, Jenyns, Brit. Vert., p. 34.

I insert this species on the authority of the Rev. W. S. Hore, *vide Rowe's Perambulation of Dartmoor, p.* 236. I have never met with it myself.

The *A. Hirta* of Mr. Bellamy (Natural History of South Devon, p. 369), seems, from the description, to approach *A. Savii;* but, in the absence of specimens, I am unable to say anything decisive with regard to it.

Gen. **MUS,** *Linn.*

Mus decumanus, *Brown Rat.*

Mus decumanus, Bell, Brit. Quad., p. 315. Clermont, Quad. Europe, p. 97. Jenyns, Brit. Vert., p. 32.

Common everywhere.

M. Rattus, *Black Rat.*

M. rattus, Bell, Brit. Quad., p. 311. Clermont, Quad. Europe, p. 98. Jenyns, Brit. Vert., p. 32.

Found occasionally. I have heard of both species living under one roof in a house at Plymouth. This species seems to be more of a domestic animal than the last. I do not think that the fact is as stated—that the Brown Rat wages war with the Black; but it seems to me that the former is so eager in its pursuit of food, that the latter has little chance of existing in the same neighbourhood.

M. Musculus, *Common Mouse.*

M. musculus, Bell, Brit. Quad., p. 308. Clermont, Quad. Europe, p. 100. Jenyns, Brit. Vert., p. 31.

Common everywhere. Varieties, both white and black, have been met with.

M. Sylvaticus, *Meadow Mouse.*

M. sylvaticus, Bell, Brit. Quad., p. 305. Clermont, Quad. Europe, p. 101. Jenyns, Brit. Vert., p. 30.

Common throughout the county. Much has been said with regard to singing mice, but none sing with such evident enjoyment and relish of the pleasures of a country life than these little creatures. To say that the so-called singing is the result of pain, is, as far as my experience of this species goes, a great mistake.

M. Minutus, *Harvest Mouse.*

M. messorius, Bell, Brit. Quad., p. 299.
M. minutus, Clermont, Quad. Europe, p. 103.
M. messorius, Jenyns, Brit. Vert, p. 31.

Not common, but frequently observed.

Gen. **SCIURUS,** *Linn.*

S. Vulgaris, *Squirrel.*

S. vulgaris, Bell, Brit. Quad., p. 291. Clermont, Quad. Europe, p. 116. Jenyns, Brit. Vert., p. 29.

Common throughout the county.

Gen. **MYOXUS,** *Schr.*

M. Avellanarius, *Dormouse.*

M. avellanarius, Bell, Brit. Quad., p. 295. Clermont, Quad. Europe, p. 122. Jenyns, Brit. Vert., p. 30.

Not uncommon in the south of the county. Abundant in the neighbourhood of Exeter. Constructs its nest sometimes in the branches of a bush. Two animals are sometimes found together in one nest in the ground in winter. *W. S. M. D'Urban.* In the Museum of the Plymouth Institution is a white variety.

Gen. **LEPUS,** *Linn.*

L. Timidus, *Hare.*

L. timidus, Bell, Brit. Quad., p. 333. Clermont, Quad. Europe, p. 129. Jenyns, Brit. Vert., p. 34.

Common. White varieties sometimes occur.

L. Cuniculus, *Rabbit.*

L. cuniculus, Bell, Brit. Quad., p. 348. Clermont, Quad. Europe, p. 129. Jenyns, Brit. Vert., p. 35.

Common. Varieties, both white and black found occasionally.

ORDER—RUMINANTIA.

Gen. **CERVUS,** *Linn.*

C. Elaphus, *Red Deer.*

C. elaphus, Bell, Brit. Quad., p, 394. Clermont, Quad. Europe, p. 134. Jenyns, Brit. Vert., p. 37.

Only now found in the north of the county. On the borders of Somerset, Exmoor. In 1838, one was killed near Okehampton. Fifty years since common in South Devon. *Bellamy's N. H. South Devon, p.* 196.

ORDER—CETACEA.

Gen. **DELPHINUS,** *Cuv.*

D. Delphis, *Dolphin.*

D. delphis, Bell, Brit. Quad., p. 463. Clermont, Quad. Europe, p. 146. Jenyns, Brit. Vert., p. 40.

Sometimes in the Channel. One captured off Plymouth, 1839. *Bellamy's N. H. South Devon, p.* 196.

D. Tursio, *Bottle-nosed Dolphin.*

D. tursio, Bell, Brit. Quad., p. 469. Clermont, Quad. Europe, p. 147. Jenyns, Brit. Vert., p. 41.

One killed on the Dart, five miles from its mouth, in 1814, see Montagu's description in *Wern. Mem. Vol. III., p.* 75.

Gen. **PHOCŒNA,** *Cuv.*

P. Communis, *Porpoise.*

P. communis, Bell, Brit. Quad., p. 473. Clermont, Quad. Europe, p. 149.
Delphinus phocœna, Jenyns, Brit. Vert., p. 41.

Our most common Cetacean. Numerous off the coast in stormy weather. They very frequently come some distance up rivers. I have seen so many on the Dart that a boat had much difficulty in steering clear of them.

P. Orca, *Grampus.*

P. orca, Bell, Brit. Quad., p. 477. Clermont, Quad. Europe, p. 150.
Delphinus orca, Jenyns, Brit. Vert., p. 42.

Occasionally in the Channel. In the museum of the late F. W. L. Ross, Esq., at Topsham, is a specimen of a young one 29½ inches in length, which was driven on shore at Exmouth, in 1844. An adult specimen had been seen for several days previously in Torbay.

P. Melas, *Round-headed Porpoise.*

P. melas, Bell, Brit. Quad., p. 483. Clermont, Quad. Europe, p. 51.
Delphinus melas, Jenyns, Brit. Vert., p. 42.

Although we cannot lay claim to the occurrence of large herds of the Caaing Whale, a specimen was killed and brought into Plymouth in April, 1839. *Bellamy's N. H. South Devon, p.* 196.

Gen. **PHYSETER,** *Linn.*

P. Macrocephalus, *Spermaceti Whale.*

P. macrocephalus, Bell, Brit. Quad., p. 506. Clermont, Quad. Europe, p. 157. Jenyns, Brit. Vert., p. 45.

The carcase of one of these cachelots was thrown upon the shore near Plymouth, some years since. *Bellamy's N. H. South Devon, p.* 196.

Gen. **BALŒNOPTERA,** Lacép.

B. Boops, *Rorqual.*

B. boops, Bell, Brit. Quad., p. 520. Clermont, Quad. Europe, p. 160. Jenyns, Brit. Vert., p. 47.

One was found off the Eddystone in October, 1831, and towed into Plymouth Harbour (see *Loudon's Mag. Nat. Hist., Vol. I., N. S.)*, and a second, a young one, noticed by F. W. L. Ross, Esq., was taken in a herring net in Torbay, October, 1846.

INTRODUCTION TO BIRDS.

FIVE and twenty years having elapsed since the publication of a catalogue of the birds of our county, and many enquiries having been made for one, the author has ventured to undertake the task. In its compilation he has had the valuable assistance of J. Gatcombe, Esq., a gentleman whose thorough acquaintance with the birds of Great Britain, is well known to ornithologists.

The list of Dr. Moore, published in 1837, in Louden's Magazine of Natural History, vol. i., N.S., was an admirable one, but many additions to our Avifauna have since been made.

The author has thought it unnecessary again particularly to refer to the instances of the occurrence of the rarer birds mentioned by Dr. Moore, as with regard to many (several of the Accipitres for instance), no information is forthcoming beyond that furnished by him.

The scientific arrangement, proposed by Professor J. H. Blasius, in his recently published List of the Birds of Europe, has been adopted, as well as his nomenclature. The English names are those found in Gould, Yarrell, and Morris.

THE BIRDS OF DEVON.

AVES.

ORDER I—ACCIPITRES.

FAMILY—FALCONIDŒ.

Gen. **FALCO.**

F. peregrinus, *Briss.,* Peregrine Falcon.

Not uncommon. Breeds on the cliffs along the coast.

F. subbuteo, *Linn.,* Hobby.

Scarce. Has been noticed as early as March. Bred at one time in the woods at Lydford, where they were said to be very numerous.

F. rufipes, *Bechst.,* Orange-legged Hobby.

A specimen was obtained near Kingsbridge about the year 1840, by Mr. H. Nichols, of that place, *vide Zoologist,* 1847, *p.* 1695, There is a fine old male in Mr. Pincombe's collection said to have been killed near Wembury: the female was observed but not killed.

F. æsalon, *Linn.,* Merlin.

Scarce. Only in the winter, when young birds are sometimes found.

F. tinnunculus, *Linn.,* Kestrel.

Our commonest representative of the family, and is found all the year round.

Gen. **PANDION,** *Sav.*

P. haliaetos, *Linn.,* Osprey.

Montagu remarks of this bird, that it is more common in this county than in any other part of the kingdom; but its occurrence with us now is rare, although there have been a few obtained of late years.

Gen. **PERNIS,** *Cuv.*

P. apivorus, *Linn.,* Honey Buzzard.

The only authenticated specimens appear to be the following:—One mentioned by Montagu *(vide Ornithological Dict.,* 2nd *Ed. p.* 256*)*, and one trapped on Dartmoor, and sent to Mr. Bolitho for preservation, about 1848. This specimen was examined by Mr. Gatcombe, who found that the stomach contained long whitish caterpillars.

Gen. **HALIAËTOS,** *Sav.*

H. albicilla, *Briss.,* White-tailed Eagle.

There appear to have been no captures since 1834, *vide Dr. Moore's List,* 1837.

Gen. **AQUILA,** *Briss.*

A. chrysaetos, *Linn.,* Golden Eagle.

Vide *Rowe's Perambulation of Dartmoor, Appendix, p.* 232.

A. Nævia, *Briss.,* Spotted Eagle.

One specimen only of this rare eagle has been obtained in this county, shot by Mr. Heaven, in 1859, at Lundy Island, as recorded by Mr. Matthews: *vide Zoologist,* 1861.

Gen. **BUTEO,** *Bechst.*

B. lagopus, *Brün.,* Rough-legged Buzzard.

There have been no captures since 1836, *vide Dr. Moore's List,* 1837.

B. vulgaris, *Bechst.,* Buzzard.

Common in many localities.

Gen. **MILVUS,** *Briss.*

M. regalis, *Briss.,* Kite.

In April, 1861, one of these now scarce birds was trapped at Countisbury, near Lynmouth ; still more recently, in October, 1862, near Aveton Gifford, a fine old male was shot whilst feeding on a dead sheep.

Gen. **ASTUR,** *Briss.*

A. nisus, *Linn.,* Sparrow Hawk.

Common throughout the county.

Gen. **CIRCUS,** *Lac.*

C. æruginosus, *Linn.,* Moor Buzzard.

During a severe winter about twenty years since many of these birds were obtained, all the bird preservers having specimens sent them, but since that time none appear to have been met with.

C. cyaneus, *Linn.,* Hen Harrier.

The *Blue Hawk* of the country people. Less common than formerly (as is the case with all the birds of this order), but occasionally met with.

C. cineraceus, *Mont.,* Montagu's Harrier.

Very scarce. The most recent occurrence of the species was near Plympton, in May, 1861. A specimen is also in Mr. Julian's collection, and one was obtained near Kingsbridge in 1847, by Mr. H. Nicholls : *vide Zoologist,* 1847.

FAMILY—STRIGIDŒ.

Gen. **STRIX** *Linn.*

S. flammea, *Linn.,* White Owl.

Common throughout the county.

Gen. **ULULA,** *Cuv.*

S. aluco, *Linn.,* Tawny Owl.

Common throughout the county.

Gen. **SURNIA,** *Dum.*

S. passerina, *Linn.,* Little Owl.

Only two specimens have been obtained, both many years since.

Gen. **ÆGOLIUS,** *Keys & Blas.*

Æ. otus, *Linn.,* Long-eared Owl.

Occasionally met with, and has been known to breed.

Æ. brachyotus, *Gm.,* Short-eared Owl.

Oftener met with than the last-mentioned species, but is not common.

ORDER II—CLAMATORES.

FAMILY—PICIDŒ.

Gen. **YUNX,** *Linn.*

Y. torquilla, *Linn.,* Wryneck.

Very scarce.

Gen. **GECINUS,** *Boie.*

G. viridis, *Linn.,* Green Woodpecker.

Common throughout the county.

Gen. **DRYOCOPUS,** *Boie.*

D. martius, *Linn ,* Black Woodpecker.

One specimen was obtained by Mr. Newton, killed near Crediton: see *Rowe's Perambulation of Dartmoor, Appendix, p.* 233.

Gen. **PICUS,** *Linn.*

P. major, *Linn,* Great Spotted Woodpecker.

Scarce.

P. minor, *Linn.,* Lesser Spotted Woodpecker.

Rarely met with. The last I know of, was killed in the neighbourhood of Totnes in 1861, and is now in my collection.

FAMILY—CUCULIDÆ.

Gen. **CUCULUS,** *Linn.*

C. canorus, *Linn.,* Cuckoo.

Common throughout the county.

FAMILY—MERIOPIDÆ.

Gen. **MEROPS,** *Linn.*

M. apiaster, *Linn.,* Bee-eater.

Scarce. There has been no occurrence for many years.

FAMILY—ALCEDIDÆ.

Gen. **ALCEDO,** *Linn.*

A. ispida, *Linn.,* Kingsfisher.

Common on all our rivers.

FAMILY—UPUPIDÆ.

Gen. **UPUPA,** *Linn.*

U. epops, *Linn.,* Hoopoe.

Single birds are occasionally seen in Spring and Autumn.

HIANTES.

FAMILY—CAPRIMULGIDÆ.

Gen. **CAPRIMULGUS,** *Linn.*

C. europæus, *Linn.,* Goat-sucker.

Apparently not so common as formerly, but often found in wooded districts.

FAMILY—CYPSELIDÆ.

Gen. **CYPSELUS,** *Illig.*

C. apus, *Linn.,* Swift.

Common throughout the county.

ORDER III—OSCINES.

ACUTIROSTRES.

FAMILY—HIRUNDINIDÆ.

Gen. **CHELIDON,** *Boie.*

C. urbica, *Linn.,* Martin.

Common throughout the county.

Gen. **HIRUNDO,** *Linn.*

H. rustica, *Linn.,* Swallow.

Common throughout the county.

Gen. **COTYLE** *Boie.*

C. riparia, *Linn.,* Sand Martin.

Common in some localities.

FAMILY—MUSCICAPIDÆ.

Gen. **MUSCICAPA,** *Linn.*

M. atricapilla, *Linn.,* Pied Flycatcher.

Scarce. I have heard of only two instances of its occurrence,—one at Mount Edgcumbe, and another in a garden at Plymouth.

Gen. **BUTALIS,** *Boie.*

B. grisola, *Linn.,* Spotted Flycatcher.

Common throughout the county.

FAMILY—LANIIDÆ.

Gen. **LANIUS,** *Linn.*

L. excubitor, *Linn.,* Great Grey Shrike.

Scarce, but specimens are now and then obtained.

L. collurio, Red-backed Shrike.

Not very common, but occasionally met with in some localities.

FAMILY—AMPELIDÆ.

Gen. **AMPELIS,** *Linn.*

A. garrulus, *Linn.,* Waxwing.

Scarce. There have been no captures since the winter 1849-50, when many were obtained throughout England.

FAMILY—PARIDÆ.

Gen. **REGULUS,** *Koch.*

R. cristatus, *Koch.,* Golden-crested Regulus.

Common throughout the county.

R. ignicapillus, *Brhm.,* Fire-crested Regulus.

Two specimens of this bird are in the collection of Mr. Pincombe, said to have been obtained in a garden at Devonport.

Gen. **PANURUS,** *Koch.*

P. barbatus, *Briss.,* Bearded Tit.

Scarce, but specimens have been obtained both in the south and middle of the county.

Gen. **ORITES,** *Mœhr.*

O. caudatus, *Linn.,* Long-tailed Tit.

Common.

Gen. **PARUS,** *Linn.*

P. cœruleus, *Linn.,* Blue Tit.

Common.

P. major, *Linn.,* Great Tit.

Common.

P. ater, *Linn.,* Cole Tit.

Common.

P. palustris, *Linn.,* Marsh Tit.

Common. This and the four preceding species are found in pretty nearly equal abundance throughout our county.

Gen. **SITTA,** *Linn.*

S. europæa, *Linn.,* Nuthatch.

Common.

TENUIROSTRES.

FAMILY—CERTHIIDÆ.

Gen. **CERTHIA,** *Linn.*

C. familiaris, *Linn.,* Creeper.

Not uncommon.

FAMILY—TROGLODYTÆ.

TROGLODYTES, *Veill.*

T. parvulus, *Koch.,* Wren.

Common.

FAMILY—CINCLIDÆ

Gen. **CINCLUS,** *Bechst.*

C. aquaticus, *Briss.,* Dipper.

Common on our rivers in retired places.

FAMILY—TURDIDÆ.

Gen. **TURDUS,** *Linn.*

T. merula, *Linn.,* Blackbird.

Common.

T. torquatus, *Linn.,* Ring Ouzel.

Breeds on the moors.

T. viscivorus, *Linn.,* Missel Thrush.

Common.

T. pilaris, *Linn.,* Field-fare.

Common in the winter months.

T. iliacus, *Linn.,* Redwing.

Common in severe winters.

T. musicus, *Linn.,* Thrush.

Common.

FAMILY—SYLVIIDÆ.

Gen. RUTICILLA.

R. phœnicurus, *Linn.,* Redstart.

Scarce in the south; common in the middle and north of the county.

R. tithys, *Temm.,* Black Redstart.

A regular, though sparing, winter visitor to our Southern coasts; appearing the first week in November, and leaving at the end of March or the beginning of April. It has not been known to breed.

Gen. ERYTHACUS, *Cuv.*

E. rubecula, Redbreast.

Common.

Gen. LUSCIOLA, *Keys & Blas.*

L. luscinia, *Linn.,* Nightingale.

There are only two or three well authenticated instances of its occurrence in this county recorded.

Gen. SAXICOLA, *Bechst.*

S. œnanthe, *Linn.,* Wheatear.

Common.

Gen. PRATINCOLA, *Koch.*

P. rubicola, *Linn.,* Stonechat.

Common.

P. rubetra, *Linn.,* Whinchat.

Common.

Gen. ACCENTOR, *Bechst.*

A. alpinus, *Gmel.,* Alpine Accentor.

Three specimens only have been obtained on the coast of Devon,—one at Torquay, and two in the neighbourhood of Plymouth. The two latter by Mr. J. Gatcombe, under the Hoe, in January, 1859.

A. modularis, *Linn.,* Hedge Sparrow.

Common.

Gen. SYLVIA, *Lath.*

S. hortensis, *Penn.,* Fauvette.

Not uncommon in our wooded districts.

S. atricapilla, *Briss.,* Blackcap.

Common.

S. cinerea, *Briss.,* Whitethroat.

Common.

S. curruca, *Linn.,* Lesser Whitethroat.

I do not know of any well authenticated specimen.

Gen. MELIZOPHILUS, *Leach.*

M. provincialis, *Gm.,* Dartford Warbler.

Scarce. Sometimes found in the furzebrakes on Dartmoor.

Gen. PHYLLOPNEUSTE, *Mey.*

P. sylvicola, *Lath.,* Wood Wren.

Common.

P. trochilus, *Linn.*, Willow Wren.

Common.

P. rufa, *Lath.*, Chiff-chaff.

Common.

AËDON, *Boie.*

A. galactotes, *Temn.*, Rufous Sedge Warbler.

Only two specimens of this bird have been obtained in England, the first in 1854, on the Brighton Downs, and the second in this county near the Start Point, September 25th, 1859. It was shot by W. D. Llewellyn, Esq., and is now in the British Museum: *vide Ann. Nat. Hist. Ser.* 3, *Vol. IV., pp.* 399—400.

Gen. **CALAMODYTA,** *Mey.*

C. phragmitis, *Bechst.*, Sedge Warbler.

Not uncommon.

Gen. **PARNOPIA,** *Keys & Blas.*

P. locustella, *Penn.*, Grasshopper Warbler.

Scarce.

CALAMOHERPE, *Mey.*

C. arundinacea, *Briss.*, Reed Warbler.

Inserted in Dr. Moore's List, 1837, as rare, but there are no instances of its occurrence that I am aware of.

FAMILY—MOTACILLIDÆ.

Gen. **MOTACILLA,** *Linn.*

M. yarrellii, *Gld.*, Pied Wagtail.

Common.

M. alba, *Linn.*, Grey and White Wagtail.

If this and the preceding species are distinct, which is doubtful, we can claim both as Devonian, Mr. Gatcombe having obtained three specimens of *M. alba* near Plymouth—two males and a female.

M. boarula, *Penn.*, Grey Wagtail.

Common.

Gen. **BUDYTES.**

B. flavus, *Linn.*, Ray's Wagtail.

Common.

Gen. **ANTHUS,** *Bechst.*

A. aquaticus, *Bechst.*, Rock Pipit.

Common.

A. pratensis, *Linn.*, Meadow Pipit.

Common.

A. arboreus, *Bechst.*, Tree Pipit.

Common.

A. richardi, *Vieill.*, Richard's Pipit.

Although this species is considered so rare even in Europe, yet seven undoubted specimens have been obtained near Plymouth at various times.

CRASSIROSTRES.

FAMILY—ALAUDIDÆ.

Gen. **ALAUDA,** *Linn.*

A. arvensis, *Linn.*, Skylark.

Common.

A. arborea, *Linn.*, Woodlark.

Common.

Gen. **MELANOCORYPHA,** *Boie.*

M. calandra, *Linn.*, Calandra Lark.

Mr. Gatcombe recently discovered in the collection of Mr. Pincombe, a bird preserver at Devonport, a bird of this species, and upon enquiry, found that it had been obtained in this neighbourhood, and was supposed by its possessor to be a specimen of the Shore Lark. This is the only specimen recorded as British. A description will be found in *Gould's Birds of Europe, Vol. II.; Bree's Birds of Europe, Vol. II.;* and a notice by Mr. Gatcombe, of the specimen above referred to, will shortly appear in the pages of the *Zoologist.*

FAMILY—FRINGILLIDÆ.

Gen. **CYNCHRAMUS**, *Bp.*

C. miliaria, *Linn.,* Common Bunting.

Common.

Gen. **EMBERIZA,** *Linn.*

C. citrinella, *Linn.,* Yellow Bunting.

Common.

E. cirlus, *Linn.,* Cirl Bunting.

Not uncommon in the South.

E. schœniclus, *Linn.,* Reed Bunting.

Not very common.

Gen. **PLECTROPHANES,** *Mey.*

P. nivalis, *Linn.,* Snow Bunting.

Has been met with occasionally.

Gen. **PASSER,** *Briss.*

P. montanus, *Linn.,* Tree Sparrow.

Rare. Two specimens were brought to the Plymouth market a few years ago, and another was killed at St. Budeaux more recently.

P. domesticus, *Linn.,* Sparrow.

Common. I am informed, upon good authority, that in the parish of Sheepstor, a small Moorland village, about eight miles from Plymouth, the Sparrow is *never* seen.

Gen. **FRINGILLA,** *Linn.*

F. cœlebs, *Linn.,* Chaffinch.

Common.

F. montifringilla, *Linn.,* Brambling.

Not common.

Gen. **CHLOROSPIZA,** *Bp.*

C. chloris, *Linn.,* Greenfinch.

Common.

Gen. **LINOTA,** *Bp.*

L. cannabina, *Linn.,* Linnet.

Common.

L. montium, *Gm.,* Mountain Linnet.

Scarce.

Gen. **ÆGIOTHUS,** *Cuv.*

Æ. linaria, *Linn.,* Redpole.

Not common.

Gen. **ACANTHIS,** *Keys & Blas.*

A. carduelis, *Linn.,* Goldfinch.

Common.

Gen. **CHRYSOMITRIS,** *Boie.*

C. spinus, *Linn.,* Siskin.

Occasionally in winter.

Gen. **PYRRULA,** *Möhr.*

P. rubicilla, *Pall.,* Bullfinch.

Common.

Gen. **LOXIA,** *Linn.*

L. pityopsittacus, *Bechst.,* Parrot Crossbill.

Rare. Mr. Newton, in 1838, shot nine of these birds, see *Rowe's Perambulation of Dartmoor, p.* 233.

L. curvirostra, *Linn.,* Crossbill.

Occasionally found, and has been known to breed.

L. leucoptera, *Gmel.,* American White-winged Crossbill.

The first specimen of this bird noticed in England, was found dead on the shore at Exmouth, September 17th, 1845, by Mr. E. B. Fitton; but, more recently, one or two others have been obtained in other counties.

Gen. **COCCOTHRAUSTES,** *Briss.*

C. vulgaris, *Briss.,* Hawfinch.

Occasionally found.

FAMILY—STURNIDÆ.

Gen. **STURNUS,** *Linn.*

S. vulgaris, *Linn.,* Starling.

In the south, formerly in the winter only, but recently many pairs have been known to breed. In the centre and north of the county they are common throughout the year.

Gen. **PASTOR,** *Temm.*

P. roseus, *Briss.,* Rose-coloured Pastor.

A specimen turns up now and then. The last was obtained a few years since in the neighbourhood of Kings Tamerton.

FAMILY—ORIOLIDÆ.

Gen. **ORIOLUS,** *Linn.*

O. galbula, *Linn.,* Golden Oriole.

The remark on the last-mentioned species applies to the present: a female was obtained near Millbrook a few years ago, and I saw one at Leigham in 1856 or 1857.

FAMILY—CORVIDÆ.

Gen. **FREGILUS,** *Cuv.*

F. graculus, *Linn.,* Cornish Chough.

Very scarce now on the Devon coast.

Gen. **CORVUS,** *Linn.*

C. monedula, *Linn.,* Jackdaw.

Common.

C. corax, *Linn.,* Raven.

Common.

C. frugilegus, *Linn.,* Rook.

Common. White varieties sometimes are found.

C. corone, *Linn.,* Crow.

Common.

C. cornix, *Linn.,* Hooded Crow.

Scarce.

Gen. **PICA,** *Briss.*

P. caudata, *Ray.,* Magpie.

Common.

Gen. **NUCIFRAGA,** *Briss.*

N. caryocatactes, *Linn.,* Nutcracker.

Only two specimens are recorded as Devonian, one by Montagu, and a second killed near Dawlish in 1829, but I am pretty sure I saw one in the woods at Saltram, in October, 1862.

Gen. **GARRULUS,** *Briss.*

G. glandarius, *Linn.,* Jay.

Common.

FAMILY—CORACIIDÆ.

Gen. **CORACIAS,** *Linn.*

C. garrula, *Linn.*, Roller.

Having accidentally omitted the mention of this species in its proper place in the second Order "Clamatores," I take an opportunity of now doing so before passing to the Columbæ: it should follow "*C. canorus*," *p.* 55. The only specimen recorded as having been obtained in this county, was shot in September, 1841, at Budleigh Salterton.

ORDER IV—COLUMBÆ.

FAMILY—COLUMBIDÆ.

Gen. **COLUMBA,** *Linn.*

C. palumbus, *Linn.*, Wood Pigeon.

Common.

C. livia, *Linn.*, Rock Dove.

Scarce, but are known to breed in caves on the sea coast in some localities.

C. œnas, *Linn.*, Stock Dove.

Scarce. No specimens have been recently obtained.

Gen. **PERISTERA,** *Boie.*

P. turtur, *Linn.*, Turtle Dove.

Specimens are occasionally obtained.

ORDER V—GALLINÆ.

FAMILY—PTEROCLIDÆ

Gen. **SYRRHAPTES,** *Ill.*

S. paradoxus, *Pall.*, Pallas' Sand Grouse.

Two specimens of this bird (the advent of which in such large numbers to our country has afforded so much speculation among ornithologists), were shot out of a flock of thirteen observed on Slapton Ley, near Kingsbridge, in June last.

FAMILY—TETRAONIDÆ.

Gen. **LAGOPUS,** *Briss.*

L. rupestris, *Gmel.,* Ptarmigan.

A single specimen in summer plumage, was shot on Dartmoor by Mr. Newton, in October, a few years since.

L. scoticus, *Briss.,* Red Grouse.

Two specimens at least of this species have been obtained in this county—one on Dartmoor some years ago by Mr. Newton, of Millaton, and one near Stokenham, a female, about the same time.

Gen. **TETRAO,** *Linn.*

T. urogallus, *Linn.,* Black Grouse.

Rare now. In former years they bred abundantly on our moors.

FAMILY—PERDICIDÆ.

Gen. **PERDIX,** *Linn.*

P. rubra, *Briss.,* Red-legged Partridge.

A few specimens have been procured.

Gen. **ORTYGION,** *Keys & Blas.*

O. coturnix, *Lath.,* Quail.

Occasionally met with, and have been known to breed. I have a young one which was caught by a boy near the Plymouth Cemetery, in the autumn of 1862.

ORDER VI—GRALLÆ.

FAMILY—GALLINULIDÆ.

Gen. **CREX,** *Bechst.*

C. pratensis, *Bechst.,* Corn Crake.

Common.

C. foljambei, Olivaceous Crake.

A specimen was seen fluttering against a house in Devonport, May 13th, 1829, and was captured (see *Dr. Moore's List,* 1837.)

Gen. **ORTYGOMETRA,** *Steph.*

O. porzana, *Linn.,* Spotted Crake.

Not common, but occasionally met with.

O. minuta, *Pall.,* Little Crake.

Scarce. Three or four specimens only have occurred.

Gen. **RALLUS,** *Linn.*

R. aquaticus, *Linn.,* Water Rail.

Not uncommon in winter.

Gen. **GALLINULA,** *Briss.*

G. chloropus, *Linn.,* Marsh Hen.

Common.

Gen. **FULICA,** *Linn.*

F. atra, *Linn.,* Coot.

Not uncommon.

FAMILY—OTIDÆ.

Gen. **OTIS,** *Linn.*

O. tarda, *Linn.,* Great Bustard.

Several instances of this now (as far as the British Islands are concerned) almost extinct bird, have, during the last sixty or seventy years, been found in this county, and one of the last killed in England was obtained in the parish of Bratton Clovelly, North Devon, in a marshy piece of ground, December 31st, 1851. This specimen Mr. Gatcombe had an opportunity of examining. It proved to be a female, and the stomach contained a large quantity of turnip leaves mixed with several flat flinty stones about the size of a sixpence. The base of the feathers on the breast and back were of a beautiful rose colour.

O. tetrix, *Linn.,* Little Bustard.

There have been occasional captures of this bird, and specimens now and then turn up at long intervals.

FAMILY—GLAREOLIDÆ.

Gen. CURSORIUS, *Lath.*

C. europæus, *Lath.,* Cream-coloured Courser.

An interesting account of the observance of this very rare species will be found in the *Zoologist for* 1860, *p.* 6980, by Mr. Matthews. A pair were seen by this gentleman on Braunton Burrows, North Devon; both escaped his gun, but Dr. Scott, of Exeter, has informed me that a Courser, no doubt one of these, was shortly afterwards killed in Somersetshire.

Gen. GLAREOLA, *Briss.*

G. pratincola, *Linn.,* Pratincole.

Two were seen at the mouth of the Exe, September 7th, 1851, and the late Mr. Ross informed Mr. Gatcombe that he once saw two on the Warren Sands, near Exmouth.

FAMILY—CHARADRIIDÆ.

Gen. ŒDICNEMUS, *Briss.*

Œ. crepitans, *Temm.,* Great Plover.

Specimens are occasionally obtained; but this is far from a common bird with us.

Gen. VANELLUS, *Briss.*

V. cristatus, *M. & W.,* Lapwing.

Common.

Gen. SQUATAROLA, *Cuv.*

S. helvetica, *Briss.,* Grey Plover.

Not common.

Gen. CHARADRIUS, *Linn.*

C. pluvialis, *Linn.,* Golden Plover.

Common.

Gen. EUDROMAS, *Boie.*

E. morinellus, *Linn.,* Dotterel.

Said to have bred at one time on Dartmoor, but no specimens have been observed for many years.

Gen. **ÆGIALITES,** *Boie.*

Æ. hiaticula, *Linn.,* Ring Dotterel.

Common.

Æ. cantianus, *Lath.,* Kentish Plover.

A single specimen of this bird, the only instance of its occurrence in the county, was shot on the Plymouth Breakwater by Mr. F. C. Hingston, (in whose collection it now is) May 7th, 1861.

Gen. **STREPSILAS,** *Ill.*

S. interpres, *Linn.,* Turnstone.

Not uncommon in autumn, and a few are found in breeding plumage in the spring.

Gen. **HÆMATOPUS,** *Linn.*

H. ostrilegus, *Linn.,* Oyster-catcher.

Not plentiful, but occasionally met with in the autumn.

FAMILY—SCOLOPACIDÆ.

Gen. **RECURVIROSTRA,** *Linn.*

R. avocetta, *Linn.,* Avocet.

Rare. The latest specimens of which I have any knowledge, were obtained near Kingsbridge, *vide Zoologist*, 1847, *p.* 1694, and near Plymouth in November, 1854: *Morris, Brit. Birds, Vol. IV., p.* 225.

Gen. **HYPSIBATES,** *Ntsch.*

H. himantopus, *Linn.,* Black-winged Stilt.

Rare. I know of no recent captures; *see Dr. Moore's List,* 1837.

Gen. **PHALAROPUS,** *Briss.*

P. cinereus, *Briss.,* Grey Phalarope.

Sometimes found around the coast in the south.

P. rufescens, *Briss.,* Red Phalarope.

Rare. One or two specimens only have occurred.

Gen. TOTANUS, *Briss.*

T. glottis, *Linn.,* Greenshank.

Not uncommon in autumn.

T. fuscus, *Briss.,* Spotted Redshank.

Rare. Young birds are occasionally obtained.

T. calidris, *Linn.,* Redshank.

Not uncommon in autumn.

T. glareola, *Linn.,* Wood Sandpiper.

Rare. I know of no recent captures.

T. ochropus, *Linn.,* Green Sandpiper.

Occasionally met with.

Gen. ACTITES, *Illig.*

A. hypoleucus, *Linn.,* Common Sandpiper.

Common. Breeds on the banks of the moor rivers.

Gen. LIMOSA, *Briss.*

L. ægocephala, *Lath.,* Black-tailed Godwit.

Scarce.

L. rufa, *Briss.,* Bar-tailed Godwit.

Not uncommon in autumn.

Gen. MACRORHAMPHUS, *Leach.*

M. griseus, *Gmel.,* Brown Snipe.

A single specimen of this bird was in the collection of Drew, a bird preserver at Devonport. It is also noticed by *Montagu (Ornithological Dict. 2nd edit. p. 55).*

Gen. PHILOMACHUS, *Mœhr.*

P. pugnax, *Linn.,* Ruff.

Seldom met with now.

Gen. **TRINGA,** *Linn.*

T. canutus, *Linn.*, Knot.

Frequently found in autumn.

T. maritima, *Brun.*, Purple Sandpiper.

Sometimes found during the winter, but not common.

T. subarquata, *Guld.*, Curlew-billed Sandpiper.

Sometimes found among flocks of Dunlins *(T. cinclus)* and Ring Dotterels *(Æ. hiaticula)* but are not common.

T. cinclus, *Linn.*, Dunlin.

Common.

T. minuta, *Lsl.*, Little Sandpiper.

Occasionally met with.

T. temminckii, *Lsl.*, Temminck's Sandpiper.

Two of these birds were shot in 1837, near Stonehouse Bridge.

Gen. **CALIDRIS,** *Cuv.*

C. arenaria, *Linn.*, Sanderling.

Not common.

Gen. **TELMATIAS,** *Boie.*

T. gallinula, *Linn.*. Jack Snipe.

Not uncommon.

T. gallinago, *Linn.*, Snipe.

Common.

T. major, *Gmel.*, Great Snipe.

Specimens are occasionally met with in the autumn.

Gen. **SCOLOPAX,** *Linn.*

S. rusticola, *Linn.,* Woodcock.

Common.

Gen. **NUMENIUS,** *Cuv.*

N. arquata, *Linn.,* Curlew.

Common. Breeds on the moors.

N. phæopus, *Linn.,* Whimbrel.

Flocks visit us in spring and autumn.

FAMILY—GRUIDÆ.

Gen. **GRUS,** *Pall.*

G. cinerea, Crane.

One of these birds was killed at Buckland Monachorum, on the borders of Dartmoor, in 1826.

FAMILY--ARDEIDÆ.

Gen. **ARDEA,** *Linn.*

A. cinerea, *Linn.,* Heron.

Common. There are several heronries in this county, on the Tamar at Warleigh; on the Dart at Sharpham; on the Exe at Powderham; at Shute Park, near Axminster.

A. purpurea, *Linn.,* Purple Heron.

Several specimens have from time to time been obtained. The last was an immature bird procured by Mr. Gatcombe, in October, 1857, from the Tamar.

Gen. **EGRETTA,** *Bonp.*

E. alba, *Linn.,* Great White Heron.

One of these birds was seen on the Avon, near Aveton Gifford, in 1805, by the Rev. Kerr Vaughan (see *Dr. Moore's List,* 1837.)

E. garzetta, *Linn.,* Egret.

Very rare. Two or three have been obtained from the Tamar and Dart.

E. russatus, *M'Gill,* Buff-backed Heron.

But one specimen of this bird has been obtained in England, which was killed near Kingsbridge, in 1805, and came into the possession of Montagu; at his death it was transferred with the rest of his collection to the British Museum.

Gen. **BUPHUS,** *Boie.*

B. comatus, *Pall.,* Squacco Heron.

Rare. One was killed near Kingsbridge in 1840, and one or two have since been obtained from the Tamar.

Gen. **ARDEOLA,** *Briss.*

A. minuta, *Linn.,* Little Bittern.

There have been occasional occurrences in this county of the Little Bittern, but none very recently.

Gen. **BOTAURUS,** *Briss.*

B. stellaris, *Linn.,* Bittern.

Becoming rare, but specimens are frequently obtained in hard winters.

B. lentiginosa, *Mont.,* American Bittern.

One of these rare birds was sent to Dr. Moore, which was shot at Mothecombe, December 22nd, 1829.

Gen. **SCOTÆUS,** *Keys & Blas.*

S. nycticorax, *Linn.,* Night Heron.

Several have been procured in the south of the county. A flock of eight was found on the Erme in June, 1849.

FAMILY—CICONIIDÆ.

CICONIA, *Briss.*

C. alba, *Briss.,* White Stork.

Dr. Moore mentions three specimens killed on Slapton Ley; the last Devonshire one is mentioned by my cousin in *Morris' British Birds, Vol. IV., p.* 151, as having been shot at Topsham, on the Exe, July 28th, 1852.

C. nigra, *Linn.,* Black Stork.

One killed on the Tamar, November 5th, 1831, gives this bird a place in our list.

Family—IBIDÆ.

Gen. **PLEGADIS**, *Kp.*

P. falcinellus, *Linn.,* Glossy Ibis.

In Dr. Moore's List, several are mentioned as having been procured, but I have heard of but one recently, which was shot at Holsworthy in September, 1851.

Gen. **PLATALEA,** *Linn.*

P. leucerodius, *Linn.,* White Spoonbill.

Scarce, but occasionally met with in the autumn.

Order VII—NATATORES.

Family—ANATIDÆ.

Gen. **CYGNUS,** *Linn.*

C. musicus, *Gm.,* Whistling Swan.

In the winter of 1830, a great many swans were brought to the markets in Plymouth and Devonport, which proved to be of this species. In the same year several were obtained in the north of the county.

C. atratus, *Gould,* Black Swan.

One of these birds has been killed in this county, but doubtless it was an escaped specimen.

Gen. **ANSER,** *Briss.*

A. cinereus, *Meyer,* Grey-Lag Goose.

Rare. Mr. Gatcombe has only met with two during the last twenty years. Both these were bought in the markets at Plymouth and Devonport, in 1858.

A. canadensis, *Linn.,* Canada Goose.

Four specimens of this goose, apparently wild birds, have been obtained in the county, the two last in 1860, one by Mr. F. C. Hingston, and the second by myself, now in my collection.

A. segetum, *Bechst.,* Bean Goose.

Occasionally in winter; in that of 1830, many were procured.

A. erythropus, *Linn.,* White-fronted Goose.

More frequent than the last species, numbers were obtained in the winter of 1830.

A. brenta, *Pall.,* Brent Goose.

Frequently obtained in autumn.

A. leucopsis, *Bechst.,* Bernicle Goose.

Rare. No specimen has been obtained for some years.

A. ruficollis, *Pall.,* Red-breasted Goose.

Rare. Two specimens only are recorded.

Gen. CHENALOPEX, *Steph.*

C. ægyptiaca, *Linn.,* Egyptian Goose.

Rare, but individuals, apparently wild, are occasionally obtained; a fine one is in the collection of Mr. F. C. Hingston, and a friend shot one on the Laira, in 1860.

Gen. VULPANSER.

V. tadorna, *Linn.,* Shieldrake.

Breeds in the north sparingly, and occasionally found in the south of the county in winter.

Gen. RHYNCHASPIS.

R. clypeata, *Linn.,* Shoveller.

Rare. Specimens from the Tamar, are in my collection.

Gen. ANAS.

A. querquedula, *Linn.,* Garganey.

Scarce.

A. strepera, *Linn.,* Gadwell.

Rare.

A. crecca, *Linn.,* Teal.

Not uncommon in the winter.

A. boschas, *Linn.,* Wild Duck.

Common in the winter, and breeds in some localities.

A. acuta, *Linn.,* Pintail.

Occasionally in severe winters. I obtained a pair from the Plymouth Market, shot on the Tamar in the winter of 1862.

Gen. FULIGULA, *Steph.*

F. ferina, *Linn.,* Pochard.

Occasionally in the winter.

F. nyroca, *Guld.,* Ferruginous Duck.

Rare. Only one or two specimens have occurred.

F. marila, *Linn.,* Scaup Duck.

Scarce, but sometimes obtained in severe winters.

F. cristata, *Ray.,* Tufted Duck.

Occasionally obtained in the winter months.

Gen. GLAUCION, *Keys & Blas.*

G. clangula, *Linn.,* Golden Eye.

Occasionally obtained in the winter.

HARELDA, *Leach.*

H. histrionica, *Linn.,* Harlequin Duck.

Said to have been obtained, but there is no well authenticated specimen.

H. glacialis, *Linn.*, Long-tailed Duck.

Scarce, but specimens have occasionally occurred.

Gen. SOMATERIA, *Leach.*

S. mollissima, *Linn.*, Eider Duck.

Scarce, but several specimens have been obtained from time to time.

Gen. OIDEMIA, *Flem.*

O. fusca, *Linn.*, Velvet Scoter.

Rare, only one or two specimens have been noticed.

O. nigra, *Linn.*, Scoter.

Scarce, although Dr. Moore suspected that they bred here.

Gen. MERGUS, *Linn.*

M. albellus, *Linn.*, Smew.

Occasionally found in immature plumage. I have a male in summer attire, from the Laira.

M. castor, *Linn.*, Goosander.

Occasionally obtained in immature plumage.

M. serrator, *Linn.*, Red-breasted Merganser.

Occasionally obtained in immature plumage.

FAMILY—PELECANIDÆ.

Gen. HALIEUS, *Ill.*

H. carbo, *Linn.*, Cormorant.

Not uncommon.

H. graculus, *Linn.*, Green Cormorant.

Not uncommon.

Gen. **DYSPORUS,** *Ill.*

D. bassana, *Briss.,* Gannet.

Often found in the winter.

FAMILY—LARIDÆ.

Gen. **STERNA,** *Linn.*

S. cantiaca, *Gm.,* Sandwich Tern.

Occasionally met with.

S. hirundo, *Linn.,* Common Tern.

Common in autumn.

S. arctica, *Temm.,* Arctic Tern.

Common in autumn.

S. minuta, *Linn.,* Lesser Tern.

Rare. Only a few specimens have occurred.

S. fissipes, *Briss.,* Black Tern.

Young birds are occasionally met with in autumn.

Gen. **CHROICOCEPHALUS,** *Eyt.*

C. ridibundus, *Linn.,* Laughing Gull.

Common around the coasts, and upon the estuaries in winter, but rarely found in summer. The variety *L. capistratus, Temm.,* has been obtained on the Dart, December 1849; *see Zoologist,* 1850, *p.* 2825.

C. minutus, *Pall.,* Little Gull.

Scarce, but there are specimens in several collections.

C. ichthyaetos, *Pall.,* Great Black-headed Gull.

Only one specimen of this bird has been obtained in England, which was shot by a boatman near Exmouth, in June, 1859. For a description, and as to usual habitat, *see Bree's Birds of Europe, Vol. IV.*

Gen. **RISSA,** *Leach.*

R. tridactyla, *Linn.,* Kittiwake.

Not uncommon during autumn and winter.

Gen. **LARUS,** *Linn.*

L. canus, *Linn.,* Common Gull.

Common.

L. argentatus, *Brun.,* Herring Gull.

Common.

L. fuscus, *Linn.,* Lesser Black-backed Gull.

Not uncommon.

L. marinus, *Linn.,* Great Black-backed Gull.

Not uncommon.

L. glaucus, *Brun.,* Glaucous Gull.

Rare in full plumage. Young birds are occasionally obtained.

L. leucopteris, *Fab.,* Iceland Gull.

Scarce, but several specimens in immature plumage have been obtained.

Gen. **PAGOPHILA,** *Kp.*

P. eburnea, *Linn.,* Ivory Gull.

A specimen was shot at Livermead, near Torquay, in January, 1853, which is, I believe, the only instance of its having been noticed in the county.

Gen. **LESTRIS,** *Ill.*

L. catarrhactes, *Linn.,* Skua.

Occasionally met with in autumn and winter.

L. pomarina, *Temm.,* Pomarine Skua.

Scarce, but sometimes met with in the autumn: this and the following species are called "Irish lords" by the boatmen.

L. parasitica, *Brun.,* Richardson's Skua.

Occasionally met with in autumn.

L. longicauda, *Briss.,* Buffon's Skua.

Rare, but one or two specimens have been procured.

FAMILY—PROCELLARIDÆ.

Gen. PROCELLARIA, *Linn.*

P. glacialis, *Linn.,* Fulmar.

I only know of two captures of this bird, one shot at Bigbury a few years since, now in my collection; and a second in the north a year or two since.

Gen. THALASSIDROMAS, *Vig.*

T. pelagica, *Linn.,* Stormy Petrel.

Common on some parts of the coast.

T. leachii, *Temm.,* Fork-tailed Petrel.

Occasionally obtained.

Gen. PUFFINUS, *Briss.*

P. major, *Fab.,* Cinereous Shearwater.

Occasionally obtained.

P. arcticus, *Fab.,* Manx Shearwater.

Occasionally met with.

FAMILY—ALCIDÆ.

Gen. MERGULUS, *Ray.*

M. alle, *Linn.,* Little Auk.

Scarce, but there are specimens in some collections, obtained in the autumn and winter months.

Gen. **URIA,** *Mœhr.*

U. grylle, *Linn.,* White-winged Black Guillemot.

Rare. The last specimen obtained was shot near Plymouth in January, 1863, and is now in my collection.

U. troile, *Brun.,* Guillemot.

Common on our coast. The variety *U. lachrymans* (the Ringed Guillemot), has been obtained in Plymouth Sound by Mr. J. Gatcombe.

Gen. **ALCA,** *Linn.*

A. impennis, *Linn.,* Great Auk.

A specimen of this now extinct species was picked up dead on Lundy Island, in 1829.

A. torda, *Linn.,* Razor-bill.

Common around our coast.

Gen. **FRATERCULA,** *Briss.*

F. artica, *Linn.,* Puffin.

Scarce in the south, but common on the north coast, where they breed.

FAMILY—EUDYTIDÆ.

Gen. **EUDYTES,** *Illig.*

E. septentrionalis, *Linn.,* Red-throated Diver.

Rare in the adult plumage, but young birds are often obtained.

E. glacialis, *Linn.,* Great Northern Diver.

The remark with regard to the last species applies to the present.

E. arcticus, *Linn.,* Black-throated Diver.

Rare in adult plumage, but young birds are sometimes obtained. There is a fine specimen in full plumage in the Museum of the Torquay Natural History Society.

FAMILY—COLYMBIDÆ.

Gen. **COLYMBUS,** *Linn.*

C. cristatus, *Linn.,* Great Crested Grebe.

Not uncommon in severe winters.

C. rubicollis, *Lath.,* Red-necked Grebe.

Rare.

C. cornutus, *Linn.,* Sclavonian Grebe.

Sometimes obtained in immature plumage.

C. auritus, *Linn.,* Eared Grebe.

Young birds are occasionally met with; but, like the two last mentioned species, it is rarely obtained in adult plumage.

C. minor, *Lath.,* Little Grebe.

Common throughout the county.

INTRODUCTION TO REPTILES AND AMPHIBIANS.

In this list, as in that of the Mammals, the scientific names have been taken from Lord Clermont's "Quadrupeds and Reptiles of Europe," and the works of Jenyns and Bell are referred to for the synonymy, and are quoted as follows:—

"A Guide to the Quadrupeds and Reptiles of Europe," by Lord Clermont, 12mo., 1859. [Clermont, Quad. and Rept. Europe.]

"A History of British Reptiles," by Thomas Bell, F.R.S. 2nd edit. 8vo. 1849. [Bell, Brit. Rept.]

"A Manual of British Vertebrate Animals," by Rev. Leonard Jenyns, M.A., 8vo., 1835. [Jenyns, Brit. Vert.]

THE REPTILES AND AMPHIBIANS OF DEVON.

REPTILIA.

ORDER—SAURIA.

FAMILY—LACERTINIDÆ.

Gen. **LACERTA,** *Linn.*

L. stirpium, *Daud.*, Sand Lizard.

L. stirpium, Clermont, Quad. and Rept. Europe, p. 182.
L. agilis, Bell, Brit. Rept., p. 18.
L. stirpium, Jenyns, Brit. Vert., p. 291.

Scarce. I have seen it near Weston Mills, Plymouth, and Mr. Reading, on Roborough Down. "On the Dawlish Warren, not common," W. S. M. D'Urban.

L. vivipara, *Jacq.*, Viviparous Lizard.

L. vivipara, Clermont, Quad. and Rept. Europe, p. 183.
Zootaca viviparà, Bell, Brit. Rept., p. 35.
L. agilis, Jenyns, Brit. Vert., p. 292.

Common throughout the county. I have met with it on both Dartmoor and Exmoor.

FAMILY—SCINCOIDÆ.

Gen. **ANGUIS.**

A. fragilis, *Linn.*, Slow-worm.

A. fragilis, Clermont, Quad. and Rept. Europe, p. 207. Bell, Brit. Rept., p. 41. Jenyns, Brit. Vert., p. 295.

Common throughout the county.

OPHIDIA.

FAMILY—COLUBRIDÆ.

Gen. **COLUBER,** *Linn.*

C. natrix, *Linn.,* Common Snake.

C. natrix, Clermont, Quad. and Rept. Europe, p. 220.
N. torquata, Bell, Brit., p. 49. Jenyns, Brit. Vert., p. 296.

Common in many localities, but scarce in the neighbourhood of Exeter. Frequently on banks of rivers. Very large specimens are sometimes found.

FAMILY—VIPERIDÆ.

Gen. **PELIAS,** *Merr.*

P. berus, *Merr.,* Viper.

P. berus, Clermont, Quad. and Rept. Europe, p. 234. Bell, Brit. Rept., p. 61.
Vipera communis, Jenyns, Brit. Vert., p. 297.

Common throughout the county.

AMPHIBIA.

ORDER—BATRACHIA.

FAMILY—RANIDÆ.

Gen. **RANA,** *Linn.*

R. esculenta, *Linn.,* Edible Frog.

R. esculenta, Clermont, Quad. and Rept. Europe, p. 240. Bell, Brit. Rept., p. 110. Jenyns, Brit. Vert., p. 301.

Has been met with, but is scarce.

R. temporaria, *Linn.,* Frog.

R. temporaria, Clermont, Quad. and Rept. Europe, p. 241. Bell, Brit. Rept., p. 89. Jenyns, Brit. Vert., p. 300.

Common throughout the county.

Gen. **BUFO,** *Laur.*

B. vulgaris, *Flem.,* Toad.

B. vulgaris, Clermont, Quad. and Rept. Europe, p. 252. Bell, Brit. Rept., p. 115. Jenyns, Brit. Vert., p. 301.

Common throughout the county, abundant in many localities.

B. viridis, *Dum & Bib.,* Natter Jack Toad.

B. viridis, Clermont, Quad. and Rept. Europe, p. 253.
B. calamita, Bell, Brit. Rept. p. 126. Jenyns, Brit. Vert. p. 302.

I have much pleasure in inserting this species in the Devon list, a specimen having been observed last summer for the first time, I believe in this county, by Mr. Reading, near Wrangerton.

SALAMANDRIDÆ.

Gen. **TRITON,** *Laur.*

T. cristatus, *Laur.,* Common Warty Newt.

T. cristatus, Clermont, Quad. and Rept. Europe, p. 261. Bell, Brit. Rept., p. 129.
T. palustris, Jenyns, Brit. Vert., p. 303.

Not uncommon.

T. punctatus, *Dum. & Bib.,* Common Smooth Newt.

T. punctatus, Clermont, Quad. and Rept. Europe, p. 264.
Lissotriton punctatus, Bell, Brit. Rept., p. 143.
T. punctatus, Jenyns, Brit. Vert., p. 304.

Common throughout the county.

T. palmatus, *Dum. & Bib.,* Palmated Smooth Newt.

T. palmatus, Clermont, Quad. and Rept. Europe, p. 265.
Lissotriton palmipes, Bell, Brit. Rept., p. 154.

Not uncommon in many localities.

A

CATALOGUE

OF THE

LEPIDOPTERA OF DEVON AND CORNWALL.

Part II.

BY J. J. READING, M.E.S.

The Council of the Plymouth Institution and Devon and Cornwall Natural History Society being desirous to embody, in the Annual Reports, a Catalogue of the Fauna and Flora of the two counties, the following is the second instalment towards that object. The rhopalocerous section was treated of in the last report; and, in the present, there is a list of native insects belonging to the first and second groups of the *Heterocera,* viz., the *Sphingina* and *Bombycina.*

This second portion of the Catalogue has been prepared mainly from the original notes and observations of the writer, who has been assisted (with respect to distant habitats) by reliable correspondents; printed books having been referred to only when other authority was wanting.

The arrangement adopted is that of Stainton's "Manual of British Butterflies and Moths,"—selected in consequence of its being not only the latest complete work on the British Lepidoptera, but also the most accessible.

When initials are appended, the writer is indebted to his correspondents, to whom he takes this opportunity of returning his warmest acknowledgments.

The following contributors' names are abbreviated in the Catalogue, as in the subjoined list:—

Dr. Battersby, Torquay	*Dr. B.*
Dr. Cocks, Falmouth (contributions towards a Fauna of Falmouth)	*Faun. Fal.*
Rev. Z. J. Edwards, Axminster	*Z. J. E.*
Rev. G. C. Green, Modbury	*G. C. G.*
Dr. Jordan, Teignmouth	*Dr. J.*
Mr. G. F. Matthews, Barnstaple	*G. F. M.*
Mr. E. Parfitt, Exeter	*E. P.*
Mr. R. B. Reed, 12th Regt.	*R. B. R.*

Ham Street, Plymouth,
October, 1863.

ORDER—LEPIDOPTERA.

SECTION II—HETEROCERA, *Bois.*

GROUP I—SPHINGINA, *Staint.*

FAMILY—ZIGÆNIDÆ, *Leach.*

Gen. **PROCRIS,** *Fab.*

53. **P. Statices,** *Lin.*

Sphinx Statices, Lin. Sys. Nat. ii. 808.
Ino Statices, Steph. Illust. Haust. i. 106.—West. & Hum. Brit. Moth. i. 28, pl. 6, f. 8-10.

Procris Statices, Staint. Man. i. 78.

Common and local. Frequents open places and meadows near woods.

App.—June and July.

Loc.—Near Plym-bridge ; Berry Pomeroy ;—Axminster ; and Musbery, *Z. J. E.* ; Exeter, *E. P.* ; South-down, *Mr. J. S. Dell.*

Gen. **ANTHROCERA,** *Scop.*

54. **A. Trifolii,** *Esp.*

Sphinx Trifolii, Esp. Schmett. ii. 123, t. 34, Cont. 9, fig. 45.
Anthrocera Trifolii, Steph. Illust. Haust. i. 108.—West. & Hum. Brit. Moth. i. 30.—Staint. Man. i. 80.

Common in some places in North Devon, but rare in the neighbourhood of Plymouth.

App.—June and July.

Loc.—Quarries, Oreston ;—Axminster, *Z. J. E.* ; Barnstaple, *G. F. M.* ; Exeter, *E. P.* ; South-down, *Mr. J. S. Dell* ; Bickleigh, *Mr. Rogers.*

Is partial to slopes of hills where the *Flora* is of vigorous growth.

55. **A. Loniceræ,** *Esp.*

Sphinx Loniceræ, Esp., Schmett. ii. 183, t. 24, Sup. 6, fig. 1, a. b.
Anth. Loti, West. & Hum. Brit. Moth., i. 29.
Anth. Loniceræ, Staint. Man. i. 81.

Not unfrequent in North Devon, but rare in the district of Plymouth.

App.—July, and inhabits similar situations as *A. Trifolii.*

Loc.—Once at Cattedown;—Barnstaple, *G. F. M.;* Torquay, *Dr. B.;* Falmouth, *Faun. Fal.;* South-down, *Mr. J. S. Dell.*

56. **A. Filipendulæ,** *Lin.*

Sphinx Filipendulæ, Lin. Sys. Nat. ii. 805.
Anth. Filipendulæ, West. & Hum. Brit. Moth. i. 29, pl. 6, fig. 11-14.—Staint. Man. i. 81.

Commonly distributed and abundant.

App.—June and July.

Loc.—Mount Batten; Bovisand; Kingsbridge; Slapton; Berry-head; Berry Pomeroy; Seaton;—Barnstaple, *G. F. M.;* Exeter, *E.P.;* Torquay, *Dr. B.*

FAMILY—SPHINGIDÆ, *Leach.*

Gen. **SMERINTHUS,** *Lat.*

57. **S. Ocellatus,** *Lin.*

Sphinx Ocellatus, Lin. Sys. Nat. ii. 796.
Smerinthus Ocellatus, Steph. Illust. Haust. i. 112.—West. & Hum. Brit. Moth. i. 7, pl. 1, fig. 1-7.—Staint. Man. i. 87.

Common in the neighbourhood of Barnstaple; not common at Exeter; rare in the Plymouth district; and throughout Cornwall generally scarce.

App.—June and July.

Loc.—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Axminster, *Z. J. E.;* Torquay, *Dr. B.;* Plymouth, *Mr. J. S. Dell;* Falmouth, *Faun. Fal.*

This insect is seldom met with in the *imago* state; the *larvæ,* however, are easily obtained by searching for them amongst foliage of the different species of *Salix* and *Prunus.* Mr. G. F. Mathews informs me that he has taken the *larvæ* "abundantly on young apple trees."

Occurs (in the larval state) in September.

58. **S. Populi,** *Lin.*

Sphinx Populi, Lin. Sys. Nat. ii. 797.
Smerinthus Populi, Steph. Illust. Haust. i. 112.--West. & Hum. Brit. Moth. i. 7, pl. i, fig. 4-6.—Staint. Man. i. 87.

Commonly distributed and abundant. Often taken at suburban gas lamps ; attracted thither by light.

App.—May, June, and July.

"Generally double-brooded," *G. F. M.*

59. **S. Tiliæ,** *Lin.*

Sphinx Tiliæ, Lin. Sys. Nat. ii. 797.
Smerinthus Tiliæ, Wood. Ind. Ent. t. 4, fig. 8.—West. & Hum. Brit. Moth. i. 8, pl. 2, fig. 7-9.—Staint. Man. i. 87.

Abundant at Crediton ; but rare in the Plymouth district.

App.—May, June, and July.

Loc.—Crediton, *G. F. M.;* Exeter, *E. P.;* Torquay, *Dr. B.;* Plymouth, *Mr. J. S. Dell.*

Gen. **ACHERONTIA,** *Och.*

60. **A. Atropos,** *Lin.*

Sphinx Atropos, Lin. Sys. Nat. ii. 799.
Brachyglossa Atropos, Boisduval I. M. 33.
Acherontia Atropos, Wood. Ind. Ent. t. 4, fig. 10.—West. & Hum. Brit. Moth. i. 9, pl. 2.—Staint. Man. i. 88.

Not unfrequent during some seasons.

App.—Imago, Sep. and Oct. ; *larva* and *pupa*, Aug. and Sept.

Loc.—Plymouth ; Plympton ; Ivybridge ; Totnes ; Dartmouth ; Kingsbridge ; Bovisand ; Turnchapel ; Millbrook ; Saltash ; Beerferris ; Liskeard ; Truro ;—Axminster, *Z. J. E.;* Barnstaple, *G. F. M.;* Topsham, *E. P.;* Torquay, *R. B. R.;* Falmouth, *Faun. Fal.*

The *imago* is, at times, captured in country cottages ; it being attracted therein by light. The most successful way of obtaining specimens of this (the largest European) moth is, by seeking in fields of potatoes for the larva and pupa.

Gen. **SPHINX,** *Auct.*

61. **S. Convolvuli,** *Lin.*

Sphinx Convolvuli, Lin. Sys. Nat. ii. 798.—Wood. Ind. Ent. pl. 4, fig. 11. —West. & Hum. Brit. Moth. pl. 3, fig. 1-3.—Staint. Man. i. 89.

Generally rare, but occurring some seasons abundantly, when it may be caught at morning and evening twilight, hovering over flowers of the *petunia* kind.

App.—September and October.

Loc.—In and around Plymouth; Saltash; Beerferris; Tavistock; Liskeard; Truro;—Barnstaple and Crediton, *G. F. M.;* Exeter, *E. P.;* Torquay, *R. B. R.;* Falmouth, *Faun. Fal.*

Hybernated specimens or examples from backward *pupæ* are found in June, July, and August.

62. **S. Ligustri,** *Lin.*

Sphinx Ligustri, Lin. Sys. Nat. ii. 799.—Wood. Ind. Ent. t. 4, fig. 12.—West. & Hum. Brit. Moth. i. 13, pl. 3, fig. 4-6.—Staint. Man. i. 90.

Common.

App.—June and July.

Least rare of the family. Occurring in almost every locality throughout Devon and Cornwall. The caterpillars feed upon the privet, lilac, elder, ash, and *laurustinus*, and are full fed in August and September.

Gen. **DEILEPHILA,** *Och.*

63. **D. Euphorbiæ,** *Lin.*

Sphinx Euphorbiæ, Lin. Sys. Nat. ii. 802.
Deilephila Euphorbiæ, Wood. Ind. Ent. pl. 4, fig. 14.—West. & Hum. Brit. Moth. i. 16, pl. 4, fig. 1-4.—Staint. Man. i. 92.

Very rare.

The most recent capture of this species is recorded by Dr. W. P. Cocks, in his "Contributions to the Falmouth Fauna." It is stated therein that an example was "procured in 1847, near Treworles, Pendower Sands."

This insect, now the rarest species of the genus, was formerly the commonest. The late Mr. Raddon, of Barnstaple, in 1814, found hundreds of the larvæ on the sea spurge *(euphorbiæ paralias)*, growing on the sand-hills of Braunton Burrows. But Mr. G. F. Mathews informs me that this moth is "no longer found in the larval state on Braunton Burrow sand-hills, nor has it occurred since the time of Raddon, and may now be looked upon as extinct."

64. **D. Galii,** *Schiff.*

Sphinx Galii, Schiff. Wern. Verz. 42.—Wood. Ind. Ent. t. 4, fig. 15.
Deilephila Galii, West. & Hum. Brit. Moth. i. 18, pl. 4, fig. 4-5.—Staint. Man. i. 94.

Not very uncommon.

App.—July, August, and September.

Loc.—Ilfracombe, *G. F. M.*; Exeter, *E. P.*; Plymouth, *Messrs. Bolitho*, *J. S. Dell, W. H. Hayward*, and *C. Rogers*.

Formerly this insect, over the area of Devon and Cornwall, was very rare; but latterly it has become of more frequent occurrence.

65. **D. Livornica,** *Esp.*

Sphinx Livornica, Esp. Schmett. ii. 87, 196, t. 8, fig. 4.
Deilephila Lineata, Steph. Ill. Haust. 1, pl. 12, fig. 1.
Deilephila Livornica, West. & Hum. Brit. Moth. i. 19, pl. 4, fig. 6-8.—Staint. Man. i. 94.

Not common.

App.—April, May, and June.

Loc.—Kingsbridge; Cornwood-road Station;—Gardens, Naval Hospital, Stonehouse, *Mr. Bartlett*; North-corner, Devonport, *G. C. G.*; Laira, *Mr. Bolitho*; Plymouth, *Mr. Rogers*; Torquay, *Mr. Stewart*; Exeter, *Mr. Potter*; Alphington, *Mr. Dorville*; Falmouth, *Faun. Fal.*

D. Livornica is met with nearly as frequently as the species mentioned next above. Both are considered rare insects by British Lepidopterists. Of the whole number captured in Britain, Devonshire has, perhaps, produced a greater total than any other county. During the decade just past, eighteen or twenty examples have fallen to the share of the vigilant lepidopterists of the county.

Gen. CHÆROCAMPA, *Dup.*

66. **C. Nerii,** *Lin.*

Sphinx Nerii, Lin. Sys. Nat. ii. 798.
Daphnis Nerii, Curt. Brit. Ent. pl. 626.
Chærocampa Nerii, Staint. Man. i. 95.

Very rare.

This is not an admitted British insect; but a supposed emigrant from the continent of Europe. It is common in countries bordering the Mediterranean Sea; but to the northward of Italy it is not so plentiful.

There appears no very good reason for excluding this from the list of our indigenous species; indeed, there are better grounds for considering it a native, than for so determining the majority of the rarer *sphingidæ* included in the British catalogue. There is the authority of the late Capt. Blomer for the finding of the *larva* at Teignmouth, and that of the late Mr. Raddon for its discovery near Barnstaple.

67. **C. Elpenor,** *Lin.*

Sphinx Elpenor, Lin. Sys. Nat. ii. 801.
Deilephila Elpenor, Wood. Ind. Ent. t. 4, fig. 18.
Metopsilus Elpenor, Dun. Brit. Moth. pl. 11, fig. 1.
Chærocampa Elpenor, West. & Hum. Brit. Moth. i. 22, pl. 5, 7-8.—Staint. Man. i. 96.

Not uncommon.

App.—July.

Loc.—Hoe, Plymouth; Batten; Bovisand; Ford; Millbrook; Kingsbridge; Knackersknowle; Tavistock; Saltash; St. Germans; Looe; Truro;—Exeter, *E. P.;* Barnstaple, *G. F. M.;* Axminster, *Z. J. E.;* Torquay, *R. B. R.;* Falmouth, *Faun. Fal.*

68. **C. Porcellus,** *Lin.*

Sphinx Porcellus, Lin. Sys. Nat. ii. 801.
Deilephila Porcellus, Wood. Ind. Ent. pl. 4, fig. 19.
Metopsilus Porcellus, Dun. Brit. Moth. pl. 11, fig. 2-3.
Chærocampa Porcellus, West. & Hum. Brit. Moth. i. 23, pl. 5, fig. 9-10.—Staint. Man. i. 97.

Not common.

App.—June.

Loc.—Hoe, Plymouth; Hooe; Bovisand; Stoke;—Ilfracombe, *G. F. M.;* Torquay, *Dr. B.;* Alphington, near Exeter, *Mr. Dorville;* Falmouth, *Faun. Fal.*

FAMILY—SESIIDÆ, *Steph.*

Gen. **MACROGLOSSA,** *Och.*

69. **M. Stellatarum,** *Lin.*

Sphinx Stellatarum, Lin. Sys. Nat. ii. 803.—Wood. Ind. Ent. pl. 4, fig. 20.
Macroglossa Stellatarum, West. & Hum. Brit. Moth. i. 24, pl. 6, fig. 1-3.—Staint. Man. i. 98.

Common. Frequenting gardens throughout both Devon and Cornwall.

App.—May to October.

Gen. **SESIA,** *Fab.*

70. **S. fuciformis,** *Lin.*

Sphinx Fuciformis, Faun. Suec. 1092, Sys. Nat. ii. 803.
Sesia Bombyliformis, Wood. Ind. Ent. t. 4, fig. 21.
Sesia Fuciformis, West. & Hum. Brit. Moth. i. 26, pl. 6, fig. 7.—Staint. Man. i. 91.

Not rare in the neighbourhood of Exeter and Falmouth.

App.—June.

Loc.—Fordland-wood, near Exeter, *E. P.;* Torquay, *Dr. B.;* Bickleigh Vale, *Mr. J. S. Dell;* Falmouth, *Faun. Fal.*

71. **S. bombyliformis,** *Esp.*

Sphinx Bombyliformis, Esp. S. ii. 180, t. 23.
Sphinx Fuciformis, Wood. Ind. Ent. t. 4, fig. 22.
Sesia Bombyliformis, West. & Hum. Brit. Moth. i. 26, pl. 6, fig. 4-6.—Staint. Man. i. 99.

Rare.

App.—June.

Loc.—Barnstaple, *G. F. M.;* Bickleigh Vale, *Mr. J. S. Dell;* Falmouth, *Faun. Fal.*

FAMILY—ÆGERIIDÆ, *Steph.*

Gen. **SPHECIA,** *Hub.*

72. **S. apiformis,** *Lin.*

Sphinx Apiformis, Lin. Sys. Nat. ii. 804.—Faun. Suec. 1093.
Ægeria Apiformis, Newn. Ent. Mag. vol. i. 74.
Sphecia Apiformis, West. & Hum. Brit. Moth. i. 34, pl. 7, fig. 2-16.
Trochilium Apiformis, Steph. Illust. Haust. i. 137.
Sphecia Apiformis, Staint. Man. i. 102.

Rare.

The larva of this, and of the species next to be referred to, feeds upon the wood of living trees; *S. Apiformis* being partial to poplar, whilst that of *S. Bembeciformis* prefers willow.

App.—June and July.

Loc.—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Bickleigh Vale, *Mr. J. S. Dell;* Falmouth, *Faun. Fal.*

73. **S. bembeciformis,** *Hub.*

Sphinx Bembeciformis, Hub. Sp. t. 20, fig. 98.
Trochilium Crabroniforme, Steph. Illust. Haust. i. 138.
Ægeria Bembeciformis, Newn. Ent. Mag. vol. i. 75.
Sphecia Bembeciformis, West. & Hum. Brit. Moth. pl. 7, fig. 1 & 15.—Staint. Man. i. 102.

Rare.

App.—July.

Loc.—Longbridge; Plympton;—Barnstaple, *G. F. M.*

Gen. **TROCHILIUM,** *Scop.*

74. **T. ichneumoniforme,** *Schiff.*

Sphinx Ichneumoniformis, Schiff. Wern. Verz.
Sesia Ichneumoniformis, Lasp. Ses. Europ. p. 16.
Ægeria Ichneumoniformis, Curt. Brit. Ent. pl. 53.
Bembecia Ichneumoniformis, Newn. Mon. Æger. Ang. Ent. Mag. i. 77.
Trochilium Ichneumoniforme, West. & Hum. Brit. Moth. i. 38.—Staint. Man. i. 104.

Not rare.

Found more commonly on the coast than inland, where it frequents grassy slopes inclined to the sea. Like its congeners, it flies during sunshine; but, as soon as over-shadowed, alights on the tops of plants, where it is easily captured by sweeping the herbage with an entomological net.

App.—June, July, and August.

Loc.—Hoe, Plymouth; Whitsand-Cliffs; Batten; Bovisand; Bolthead; Dartmouth; Brixham; Anstey's Cove, Torquay; Teignmouth; Seaton;—Falmouth, *Faun. Fal.*

75. **T. philanthiforme,** *Lasp.*

Sesia Philanthiformis, Lasp. Ses. Europ. 31, fig. 23-28.
Sphinx Muscæformis, Esp. Europ. Schmett. tab. 32, cont. 7, fig. 5. (?)
Sesia Philanthiformis, Mihi. Zool. 7282 (1860).

Rare.

App.—June.

Loc.—Bolthead; Whitsand Cliffs.

Found on grassy slopes that are inclined to the sea.

This insect was first discovered in England in 1860. The honour of first adding it to the list of British Lepidoptera is divided between Mr. King, of Torquay, and myself. It was taken by Mr. King, near Bolthead, (month not recorded), and by myself on the cliffs at Whitsand Bay, on the 18th of June, 1860. Hence the species is both Devonian and Cornish, and has not hitherto been observed in any other county in England.

Although this species was not taken in England until 1860, yet, during the past thirty years, descriptions, more or less accurate, have been inserted in the lepidopterological literature of this country. Stephens, Newman, Wood, and Westwood all refer to this insect as a British species; but they included it among the indigenous lepidoptera by mistake, which arose through considering a rubbed or damaged specimen of *T. ichneumoniformis* to be this species.

T. Philanthiformis, Lasp., is distinct from all the British species of the genus, but may be said to be nearer allied to *T. ichneumoniformis* than either of the others. It is at once recognized as distinct from that insect by its abdominal segments being ornamented with THREE (typical) VERY NARROW SILVERY-WHITE RINGS; while, in *ichneumoniformis*, the abdomen is embellished with SIX or SEVEN BROAD RINGS of a DEEP YELLOW. The former insect is altogether of a more sombre hue than the latter.

The identification of this insect is most probably correct, since qualified continental lepidopterists have compared our insect with theirs, and pronounced it to be in agreement with the decision given above.

Mr. Doubleday writes me on the 14th October, 1863:—" Since I last wrote to you I have sent specimens of our little *Sesia* to Dr. Standiger, of Dresden, who has paid great attention to the species of this genus. He says—' Our insect is most certainly the *Philanthiformis* of Laspeyres, but not of Herrich-Schöffer, and probably the *Muscæformis* of Esper;' but his plates are so rude that it is not always easy to decide, with certainty, which species he intended, when there are three or four very closely allied."

76. **T. cynipiforme,** *Och.*

Sesia Cynipiformis, Och. Schmett. Europ. ii. 151.
Sesia Vespiformis, Lasp. Ses. Europ. p. 17.
Ægeria Cynipiformis, Steph. Ill. Haust. pl. 11, fig. 2, male.
Synathedon Œstriforme, Newn. Mon. Æger. Ang. Ent. Mag. i. 76.
Trochilium Cynipiforme, West. & Hum. Brit. Moth. i. 38, pl. 7, fig. 6.—Staint. Man. i. 104.

Local and rare.

App.—May and June.

Loc.—Exeter, *E. P.;* Plymouth, Radford Wood, *Mr. Rogers;* Devonport, *Mr. J. S. Dell.*

An inhabitant of woods; the larva feeds on the bark of oak.

77. **T. tipuliforme,** *Lin.*

Sphinx Tipuliformis, Faun. Suec. 1096.—Lin. Sys. Nat. ii. 804.
Sesia Tipuliformis, Lasp. Ses. Europ., p. 28.
Trochilium Tipuliformis, Newn. Mon. Æger. Aug. Ent. Mag. i. 78.
Trochilium Tipuliforme, Staint. Man. i. 105.

Common.

App.—June.

Most gardens throughout Devon and Cornwall yield this insect in abundance; but the proviso is, that currant bushes must be growing therein, as the larva subsists on the pith in the stems of that tree.

78. **T. myopæforme,** *Bork.*

Sphinx Myopæformis, Bork. Nat. Europ. Sch. Sys. Ord. T. ii. p. 169.
Sesia Mutillæformis, Lasp. Ses. Europ. p. 26.
Conopia Myopæformis, Newn. Mon. Æger. Ang. Ent. Mag. i. 81.
Trochilium Myopæforme, West. & Hum. Brit. Moth. pl. 7. fig. 11.—Staint. Man. i. 106.

Rare.

App.—June and July.

Loc.—Barnstaple, *G. F. M.*

An inhabitant of gardens.

GROUP II—BOMBYCINA, *Staint.*

FAMILY—HEPIALIDÆ, *Steph.*

Gen. **HEPIALUS,** *Fab.*

79. **H. hectus,** *Lin.*

Phalæna Hecta, Lin. Sys. Nat. ii. 833.
Hepialus Hectus, Wood. Ind. Ent. pl. 5, fig. 5.—West. & Hum. Brit Moth. i. pl. 8, fig. 1-2, p. 45.—Staint. Man. i. 110.

Rare.

App.—June.

Loc.—Plymouth; Mt. Batten; Quarries, Catte-down; Stonehouse; Devonport;—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Torquay, *Dr. B.;* Falmouth, *Faun. Fal.*

80. **H. lupulinus,** *Lin.*

Phalæna lupulina, Lin. Sys. Nat. ii. 833.
Hepialus lupulinus, Wood. Ind. Ent. t. 5, fig. 4.—West. & Hum. Brit. Moth. pl. 8, fig. 3-5, p. 45.—Staint. Man. i. 111.

Not rare.

App.—May and June.

Loc.—Hoe, Plymouth; Mt. Batten; Devil's-point, Stonehouse; Park, Devonport; Bickleigh;—Barnstaple, (abundant), *G. F. M.;* Torquay, *R. B. R.;* Modbury, *G. C. G.;* Falmouth, *Faun. Fal.*

81. **H. Humuli,** *Lin.*

Phalæna Humuli, Lin. Sys. Nat. ii. 833.
Hepialus Humuli, Wood. Ind. Ent. pl. 5, fig. 1.—West. & Hum. Brit. Moth. pl. 8, fig. 7-9, p. 45.—Staint. Man. i. 111.

Abundant in most meadows throughout Devon and Cornwall; flying at evening twilight.

App.—June and July.

82. **H. Velleda,** *Esp.*

Bombyx Velleda, Esp. Schmett. pl. 195, fig. 1.
Hepialus Velleda, Wood. Ind. Ent. pl. 5, fig. 3.—West. & Hum. Brit. Moth. pl. 8, fig. 10-11, p. 46.—Staint. Man. i. 111.

Very rare.

App.—June and July.

Loc.—Torquay, *E. P.;* Moors, Ivybridge, *Miss Lothmann.*

83. **H. sylvinus,** *Lin.*

Phalæna sylvinua, Lin. Sys. Nat. ii. 834.
Hepialus sylvinus, Wood. Ind. Ent. tab. 5, fig. 6.—West. & Hum. Brit. Moth. pl. 8, fig. 12-13, p. 49.—Staint. Man. i. 111.

Not plentiful.

App.—July and August.

Loc.—Bovisand; Bickleigh; Millbrook;—Axminster, *Z. J. E.*; Torquay, *R. B. R.*; Falmouth, *Faun. Fal.*

Family—ZEUZERIDÆ, *Staint.*

Gen. **ZEUZERA,** *Lat.*

84. **Z. Æsculi,** *Lin.*

Phalæna Æsculi, Lin. Sys. Nat. ii. 833.
Zeuzera Æsculi, Wood. Ind. Ent. t. 5, fig. 8.—West. & Hum. Brit. Moth. pl. 9, fig. 4-6, p. 49.—Staint. Man. i. 113.

Rare.

App.—July.

Loc.—Barnstaple, *G. F. M.*; Fordlands, Exeter, *E. P.*; Saltram, *Mr. J. S. Dell.*

Gen. **COSSUS,** *Fab.*

85. **C. ligniperda,** *Fab.*

Cossus Ligniperda, Fab. Ent. Sys. iii. 2, p. 3.
Phalæna Cossus, Lin. Sys. Nat. ii. 827.
Cossus Ligniperda, Wood. Ind. Ent. pl. 5, fig. 7.—West. & Hum. Brit. Moth. pl. 9, fig. 1-3, p. 48.—Staint. Man. i. 114.

Not rare.

App.—June, July, August, and September.

Loc.—Mount Edgcumbe; Anthony; Liskeard; Tavistock; Bickleigh Vale; Saltram;—Musbury and Axmouth, *Z. J. E.*; Barnstaple, *G. F. M.*; Exeter, *E. P.*; Torquay, *Dr. B.*; Modbury, *G. C. G.*; Falmouth, *Faun. Fal.*

Family—NOTODONTIDÆ, *Steph.*

Gen. **CERURA,** *Schr.*

86. **C. furcula,** *Lin.*

Phalæna Furcula, Lin. Sys. Nat. ii. 823.
Cerura Furcula, Wood. Ind. Ent. pl. 5, fig. 16.—West. & Hum. Brit. Moth. pl. 15, fig. 4-6, p. 76.—Staint. Man. i. 117.

Not common.

App.—July and August.

Loc.—Stoke; Crabtree;—Barnstaple, *G. F. M.*; Exeter, *E. P.*; Torquay, *Dr. B.*

87. **C. bifida,** *Hub.*

Bombyx bifida, Hub.—Wood. Ind. Ent. pl. 5, fig. 20.
Cerura bifida, West. & Hum. Brit. Moth. pl. 15. fig. 8-9.—Staint. Man. i. 117.

Not common.

App.—July and August.

Loc.—Stoke, Plymouth ;—Barnstaple, *G. F. M.* ; Exeter, *E. P.* ; Torquay, *Dr. B.*

In the Neighbourhood of Plymouth, the larvæ of this species are mostly found on *Populus nigra.*

88. **C. vinula,** *Lin.*

Phalæna Vinula, Lin. Sys. Nat. ii. 815.
Cerura Vinula, Wood. Ind. Ent. pl. 5, fig. 21.—West. & Hum. Brit. Moth. pl. 15, fig. 12-13.—Staint. Man. i. 118.

Common throughout Devon and Cornwall.

App.—May, June, and July.

Gen. **STAUROPUS,** *Germ.*

89. **S. Fagi,** *Lin.*

Phalæna Fagi, Lin. Sys. Nat. ii. 816.
Stauropus Fagi, Wood. Ind. Ent. t. 5, fig. 23.—West. & Hum. Brit. Moth. pl. 13, fig. 1-2.—Staint. Man. i. 118.

Rare.

App.—June.

Loc.—Mount Edgcumbe ; Saltram ;—Bideford and Barnstaple, *G. F. M.* ; Topsham, *E. P.*

Gen. **NOTODONTA,** *Och.*

90. **N. dromedarius,** *Lin.*

Phalæna dromedarius, Lin. Sys. Nat. ii. 827.
Notodonta Dromedarius, Wood. Ind. Ent. t. 5, fig. 24.—West. & Hum. Brit. Moth. pl. 13, fig. 11-12.—Staint. Man. i. 119.

Rare.

App.—June.

Loc.—Plymouth ; Tavistock ;—Barnstaple, *G. F. M.* ; Exeter, *E. P.* ; Axminster, *Z. J. E.*

91. **N. tritophus,** *Schiff.*

> *Bombyx Tritophus,* Schiff.—Mull. Wern. Verz. 63.
> *Notodonta perfusca,* West. & Hum. Brit. Moth. pl. 13, fig. 13.
> *Notodonta tritophus,* Staint. Man. i. 119.

Very rare.

Loc.—Exeter, *E. P.*

92. **N. zic-zac,** *Lin.*

> *Phalæna Zic-zac,* Lin. Sys. Nat. ii. 827.
> *Notodonta Zic-zac,* Wood. Ind. Ent. t. 5, fig 26.—West. & Hum. Brit. Moth. pl. 13, fig. 14-15, p. 66.—Staint. Man. i. 119.

Common. Appears twice a year.

App.—May and June, and again in September.

Loc.—Plymouth; Liskeard;—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Torquay, *Dr. B.*

Gen. **PTEROSTOMA,** *Germ.*

93. **P. palpina,** *Lin.*

> *Phalæna palpina,* Lin. Sys. Nat. ii. 829.
> *Ptilodontis palpina,* Wood. Ind. Ent. t. 6, fig. 32.
> *Pterostoma palpina,* West. & Hum. Brit. Moth. pl. 14, fig. 6.—Staint. Man. i. 120.

Rare.

Loc.—Plymouth; Bickleigh;—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Torquay, *Dr. B.;* Modbury, *G. C. G.;* Marsh-mills, *Mr. J. S. Dell.*

Gen. **PTILOPHORA,** *Steph.*

94. **P. plumigera,** *Schiff.*

> *Bombyx plumigera,* Schiff.—Mull. Wien. Verz. 61.
> *Ptilophora plumigera,* Wood. Ind. Ent. pl. 6, fig. 33.—West. & Hum. Brit. Moth. pl. 14, fig. 18-19.—Staint. Man. i. 121.

Very rare.

Loc.—Torquay, *E. P.*

Gen. **DRYMONIA,** *Hub.*

95. **D. chaonia,** *Schiff.*

Bombyx chaonia, Schiff.—Mull. Wien. Verz. 49.
Chaonia Roboris, Wood. Ind. Ent. pl. 6, fig. 34.
Drymonia chaonia, West. & Hum. Brit. Moth. pl. 14, fig. 13-14, p. 72.-Staint. Man. i. 121.

Rare.

App.—May.

Loc.—Plymouth.

Gas lamps are a frequent resort of this insect. Attracted thither by the emitted rays of light.

96. **D. Dodonæa,** *Schiff.*

Bombyx dodonæa, Schiff.—Mull. Wien. Verz. 49.—Wood. Ind. Ent. pl. 6, fig. 35.
Drymonia dodonæa, West. & Hum. Brit. Moth. pl. 14, fig. 11.- Staint. i. 121.

Rare.

App.—May.

Loc.—Plymouth.

Gen. **LEOCAMPA,** *Steph.*

97. **L. dictæa,** *Lin.*

Phalæna dictæa, Lin. Sys. Nat. 826.
Leocampa dictæa, Wood. Ind. Ent. t. 5, fig. 27.—West. & Hum. Brit. Moth. pl. 13, fig. 16-17.—Staint. Man. i. 122.

Not common.

App.—May and June.

Loc.—Plymouth ; Bickleigh ;—Barnstaple, (common), *G. F. M.* ; Exeter, *E. P.* ; Torquay, *R. B. R.*

98. **L. dictæoides,** *Esp.*

Bombyx dictæoides, Esp. Schmett. iii, Sup. 27, t. 84. Cont. 5, fig. 2-3.
Leocampa dictæoides, Wood. Ind. Ent. pl. 5, fig. 28.—West. & Hum. Brit. Moth. pl. 13, fig. 18-19.—Staint. Man. i. 123.

Rare.

App.—June.

Loc.—Plymouth.

Gen. **LOPHOPTERYX,** *Steph.*

99. **L. Camelina,** *Lin.*

Phalæna camelina, Lin. Sys. Nat. ii. 833.
Lophopteryx camelina, Wood. Ind. Ent. pl. 5, fig. 29.—West. & Hum. Brit. Moth. pl. 14, fig. 1-2.—Staint. Man. i. 124.

Not common.

App.—May and June.

Loc.—Plymouth; Plymbridge; Ivybridge; Totnes;—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Torquay, *R. B. R.*

Gen. **DILOBA,** *Bois.*

100. **D. cæruleocephala,** *Lin.*

Phalæna cæruleocephala, Lin. Sys. Nat. ii. 826.
Episemar cæruleocephala, Wood. Ind. Ent. pl. 5, fig. 13.
Disphragis cæruleocephala, West. & Hum. Brit. Moth. pl. 16, fig. 4.
Diloba cæruleocephala, Staint. Man. i. 125.

Rare.

App.—August.

Loc.—Exeter, *E. P.;* Torquay, *R. B. R.;* Longbridge, Plymouth, *Mr. J. S. Dell.*

Gen. **PETASIA,** *Steph.*

101. **P. cassinea,** *Fab.*

Phalæna cassinia, Fab. Ent. Sys. iii. 1. 460.
Petasia cassinea, Wood. Ind. Ent. pl. 6, fig. 36.
Petasia cassinia, West. & Hum. Brit. Moth. pl. 14, fig. 7-8.
Petasia cassinea, Staint. Man. i. 125.

Not rare.

App.—November and December.

Loc.—Plymouth;—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Torquay, *Dr. B.*

Gen. **PERIDEA,** *Steph.*

102. **P. trepida,** *Fab.*

Bombyx trepida, Fab. M. ii. 121.
Peridea Serrata, Wood. Ind. Ent. t. 6, fig. 37.
Peridea trepida, West. & Hum. Brit. Moth. i. 71, pl. 14, fig. 9-10.—Staint. Man. i. 126.

Rare.

App.—May.

Loc.—Plymouth ;—Killerton, near Exeter, *E. P.;* Barnstaple, *G. F. M.*

Gen. **PYGÆRA,** *Steph.*

103. **P. bucephala,** *Lin.*

Phalæna bucephala, Lin. Sys. Nat. ii. 816.
Hammatophora bucephala, West. & Hum. Brit. Moth. pl. 13. fig. 3-4, p. 63.
Pygæra bucephala, Wood. Ind. Ent. t. 5, fig. 9.—Staint. Man. i. 128.

Very common in all districts of the two counties of Devon and Cornwall.

FAMILY—LIPARIDÆ, *Gn.*

Gen. **PSILURA,** *Steph.*

104. **P. Monacha,** *Lin.*

Phalæna Monacha, Lin. Sys. Nat. ii. 821.
Hypogymna Monacha, Wood. Ind. Ent. pl. 6, fig. 55.
Psilura Monacha, West. & Hum. Brit. Moth. i. 86, pl. 17, fig. 4-7.—Staint. Man. i. 130.

Not rare.

App.—July and August.

Loc.—Plymouth ; Bickleigh ; Tavistock ; Liskeard ; Truro ; Kingsbridge ;—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Torquay, *R. B. R.;* Modbury, *G. C. G.*

Gen. **DASYCHIRA,** *Steph.*

105. **D. pudibunda,** *Lin.*

Phalæna pudibunda, Lin. Sys. Nat. ii. 823.
Dasychira pudibunda, Wood. Ind. Ent. pl. 6, fig. 57.—West. & Hum. Brit. Moth. pl. 17, fig. 17-19.—Staint. Man. i. 131.

Common.

App.—May and June.

Loc.—Hooe ; Saltram ; Bickleigh Vale ; Kingsbridge ; Tavistock ; Liskeard ;—Barnstaple, *G. F. M;* Exeter, *E. P.;* Torquay, *R. B. R.*

Found in most woods and plantations throughout Devon and Cornwall.

Gen. **DEMAS,** *Steph.*

106. **D. Coryli,** *Lin.*

Phalæna Coryli, Lin. Sys. Nat. ii. 823.
Demas Coryli, Wood. Ind Ent. pl. 6, fig. 58.—West. & Hum. Brit. Moth. pl. 17, fig. 20-21.—Staint. Man. i. 132.

Rare.

App.—May.

Loc.—Plym-bridge;—Kingsbridge, *G. C. G.;* Torquay, *Dr. B.;* Topsham, *E. P.*

Frequents woods.

Gen. **ORGYIA,** *Och.*

107. **O. antiqua,** *Lin.*

Phalæna Antiqua, Lin. Sys. Nat. ii. 825.
Orgyia Antiqua, Wood. Ind. Ent. pl. 7, fig. 59.—West. & Hum. Brit. Moth. pl. 17, fig. 8-10.—Staint. Man. i. 132.

Not common.

App.—August and September.

Loc.—Bickleigh Down;—Barnstaple, *G. F. M.;* Exeter, *E. P.;* Falmouth, *Faun. Fal.;* Whitsand Cliffs, *Mr. J. S. Dell.*

This species, in the Plymouth district, inhabits heaths and downs, where the larvæ may be found feeding upon the common fern *(Pteris acquilina);* but in the neighbourhood of, and in London, the perfect insects are to be seen in the streets, and the larvæ abound in almost every garden, feeding upon a number of dissimilar trees and plants.

108. **O. gonostigma,** *Lin.*

Phalæna gonostigma, Lin. Sys. Nat. ii. 826.
Orgyia gonostigma, Wood. Ind. Ent. pl. 7, fig. 60.—West. & Hum. Brit. Moth. i. pl. 17, fig. 11-13.—Staint. Man. i. 132.

Rare.

App.—June and July.

Loc.—Stoke Wood, near Exeter, *E. P.;* Falmouth, *Faun. Fal.*

This species (as a British insect) is generally scarce, and is not found to be indigenous in many counties; it has, however, a habitat both in Devon and Cornwall.

Gen. **STILPNOTIA,** *Westw.*

109. **S. Salicis,** *Lin.*

Phalæna Salicis, Lin. Sys. Nat. ii. 822.
Leucoma Salicis, Wood. Ind. Ent. t. 7, fig. 64.
Stilpnotia Salicis, West. & Hum. Broth. Moth. i. pl. 18, fig. 2-4.—Staint. Man. i. 134.

Rare.

App.—June.

Loc.—Totnes ;—Exeter, *E. P.;* Torquay, *R. B. R.*

Has not hitherto been observed in the Plymouth district.

Gen. **PORTHESIA,** *Steph.*

110. **P. chrysorrhæa,** *Lin.*

Phalæna Chrysorrhæa, Lin. Sys Nat. ii. 822.
Porthesia Auriflua, West. & Hum. Brit. Moth. pl. 18, fig. 7-8.
Porthesia Chrysorrhæa, Staint. Man. i. 134.

Local and rare.

App.—August.

Loc.—Torquay, *Dr. B.; R. B. R.*

The only known locality for this insect in Devonshire is Torquay, where, Dr. Battersby informs me, he has captured it. Notices of its occurrence in other places, in Devon and Cornwall, are much wanted.

111. **P. auriflua,** *Fab.*

Bombyx Auriflua, Fab. E. S. iii. 1, 458.
Porthesia Chrysorrhæa, West. & Hum. Brit. Moth. i. 90, pl. 18, fig. 9-11.
Porthesia Auriflua, Staint. Man. 1. 135.

Local.

App.—August.

Loc.—Torquay, *Dr. B.*

Within the district of our local *Fauna* this, like the species next before, has occurred only at Torquay.

Immunity from the presence of this insect among us is considered an advantage ; though the benefit of its absence from us, is perhaps overrated by some writers on the subject. The ravages committed by the larvæ of this species on the foliage of various trees, particularly that of Hawthorn *(Cratægus orycantha)*, has at times been very great; the most remarkable period recorded, at which great devastation was occasioned among the trees in this country by this larvæ, was in 1782.

In the first volume of Westwood and Humphrey's Moths, page 91, is the following:—"It feeds on various plants, especially White-thorn, in June, and has at times become so remarkably abundant as to cause a serious panic to the Londoners, especially in 1782, when prayers were offered up in the Churches against the enemy; and the churchwardens and overseers of the neighbouring villages, after ordering rewards for collecting these caterpillars, attended to see them burnt by bushels."

NOTE.—The foregoing remarks, cited from West. & Hum.'s work, are correctly applied by them to the right insect, *P. auriflua;* but the descripton is that of the allied species *P. chrysorrhœa.*

FAMILY—LITHOSIDÆ, *Steph.*

Gen. **MILTOCHRISTA,** *Hub.*

112. **M. miniata,** *Forst.*

Phalæna miniata, Forst. Nov. Spe. Insect. cent. i. 75.—Wood. Ind. Ent. t. 8, fig. 92.
Miltochrista miniata, West. & Hum. Brit. Moth. i. pl. 19, fig. 22.—Staint. Man. i. 136.

Not uncommon.

App.—May and June.

Loc.—Milbrook; St. Germans; Liskeard; Tavistock; Bickleigh; Western-Mills; Ivybridge; Totnes;—Torquay, *Dr. B.;* Exeter, *E. P.;* Barnstaple, *G. F. M.*

Gen. **LITHOSIA,** *Fab.*

113. **L. complana,** *Lin.*

Phalæna complana, Lin. Sys. Nat. ii. 840.
Lithosia depressa, West. & Hum. Brit. Moth. i. pl. 20, fig. 14.—Staint. Man. i. 138.

Local and rare.

App.—July and August.

Loc.—Whitsand Cliffs;—Fordlands, near Exeter, *E. P.;* Barnstaple, *G. F. M.*

This insect is confined to the coast, in this neighbourhood. Its *larvæ* may be found feeding on lichens, growing on cliffs and slopes that are inclined to the sea.

*114. **L. caniola,** *Hub.*

Bombyx caniola, Hub. 220.
Lithosia caniola, Dbl. Zool. 8391.

App.—June. (?)

Loc.—Torquay.

This new *Lithosia* was added to the British lists of insects in 1861. It was detected by Henry Doubleday, Esq., among a number of other Lepidoptera brought to him for sale by Mr. King, an insect dealer of Torquay. Devon is the only county in England in which this insect has occurred; but both Mr. Barrett and Mr. Birchall have taken it in Ireland.

115. **L. complanula,** *Bois.*

Lithosia Complanula, Bois. Ind. Meth. 2 ed. 58.
Lithosia complana, West. & Hum. Brit. Moth. pl. 20, fig. 12-13.—Staint. Man. i. 138.

App.—July.

Loc.—Millbrook; Liskeard; Tavistock; Plym-bridge; Shaugh-bridge; Ivybridge; Kingsbridge;—Torquay, *Dr. B.;* Exeter, *E. P.;* Barnstaple, *G. F. M.;* Falmouth, *Faun. Fal.*

116. **L. griseola,** *Hub.*

Bombyx griseola, Hub. Bo. t. 23, fig. 97.—Wood. Ind. Ent. pl. 8, fig. 102.
Lithosia griseola, West. & Hum. Brit. Moth. i. pl. 20, fig. 10.—Staint. Man. i. 139.

Local and rare.

App.—August.

Loc.—Bickleigh-down;—Exeter, *E. P.;* Barnstaple, *G. F. M.;* Mount Edgcumbe, *Mr. J. S. Dell.*

Gen. **ŒNISTIS,** *Hub.*

117. **Œ. quadra,** *Lin.*

Phalæna quadra, Lin. Sys. Nat. ii. 840.—Wood. Ind. Ent. t. 8, fig. 105.
Œnistis quadra, West. & Hum. Brit. Moth. i. pl. 20, fig. 17-19.—Staint. Man. i. 139.

Local and rare.

App.—June.

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* *L. caniola* should precede *L. complana,* No. 113.

Loc.—Woods, Shaugh-bridge;—Stoke Wood, near Exeter, *E. P.;* Torquay, *Dr. B.; R. B. R.*

Within the range assigned to our local *fauna* this insect is scarce, except at Torquay, where, however, it is not common.

Gen. **GNOPHRIA,** *Steph.*

118. **G. rubricollis,** *Lin.*

Phalæna rubricollis, Lin. Sys. Nat. ii. 840.—Wood. Ind. Ent. pl. 81, fig. 106.
Gnophria rubricollis, West. & Hum. Brit. Moth. i. pl. 20, fig. 20-21.—Staint. Man. i. 140.

Common.

App.—June.

Loc.—Saltram; Widey; Bickleigh Vale; Ivybridge; Kingsbridge;—Torquay, *R. B. R.;* Axminster, *Z. J. E.;* Exwick Wood, Exeter, *E. P.;* Barnstaple, *G. F. M.*

This insect, together with *Lithosia complanula,* shares the notoriety of being the commonest species of this family.

Gen. **CYBOSIA,** *Hub.*

119. **C. mesomella,** *Lin.*

Phalæna mesomella, Lin. Sys. Nat. ii. 886.
Lithosia eborina, Wood. Ind. Ent. pl. 8, fig. 109.
Cybosia mesomella, West. & Hum. Brit. Moth. i. pl. 20, fig. 25.

Rare and local.

App.—July.

Loc.—Fordland, Exeter, *E. P.;* Torquay, *Dr. B.*

Gen. **PHILEA,** *Dalm.*

120. **P. irrorella,** *Lin.*

Phalæna irrorella, Lin. Sys. Nat. ii. 885.
Bombyx irrorella, Wood. Ind. Ent. pl. 8, fig. 107.
Philea irrorella, West. & Hum. Brit. Moth. i. 104, pl. 20, fig. 22-24.—Staint. Man. i. 141.

Rare.

App.—July.

Loc.—Seaton; Babbington;—Whitsand Cliffs and Mount Edgcumbe, *Mr. J. S. Dell.*

Gen. **NUDARIA,** *Haw.*

121. **N. mundana,** *Lin.*

Phalæna Mundana, Lin. Sys. Nat. ii. 812.
Nudaria Munda, Wood. Ind. Ent. pl. 7, fig. 86.—West. & Hum. Brit. Moth. i. pl. 16, fig. 19-20.
Nudaria mundana, Staint. Man. i. 141.

Not uncommon.

App.—July.

Loc.—Saltram; Plym-bridge; Cornwood; Ivybridge; Tavistock; Liskeard;—Torquay, *Dr. B.;* Exeter, *E. P.;* Barnstaple, *G. F. M.*

Usually found at the outskirts of damp woods and in the vicinity of water.

Family—CHELONIDÆ, *Gnu.*

Gen. **HYPERCOMPA,** *Steph.*

122. **H. Dominula,** *Lin.*

Phalæna Dominula, Lin. Sys. Nat. ii. 834.—Wood. Ind. Ent. pl. 7, fig. 67.
Heraclia Dominula, West. & Hum. Brit. Moth. i. pl. 19, fig. 16-17.
Hypercompa Dominula, Staint. Man. i. 144.

Local, but not rare.

App.—June.

Loc.—Bickleigh Vale; Yealmpton; Kingsbridge; Ivybridge; Berry Pomeroy;—Torquay, *R. B. R.;* Axminster, *Z. J. E.;* Exeter, *E. P.*

This beautiful insect is probably an inhabitant of most of the wooded vales of Devon and Cornwall.

Gen. **EUTHEMONIA,** *Steph.*

123. **E. Russula,** *Lin.*

Phalæna Russula, Lin. Sys. Nat. ii. 830.
Phalæna Sannio, Lin. Faun. Suec.
Euthemonia Russula, West. & Hum. Brit. Moth. i. pl. 19, fig. 11-13.—Staint. Man. i. 144.

Rare.

App.—July.

Loc.—Lower Bickleigh Down; the "Ride," above Cann Quarry;—Falmouth, *Faun. Fal.*

Gen. **ARCTIA,** *Schr.*

124. **A. caja,** *Lin.*

Phalæna caja, Lin. Sys. Nat. ii. 819.—Wood. Ind. Ent. t. 7, fig. 67.
Arctia caja, West. & Hum. Brit. Moth. i. 94, pl. 19, fig. 5-8.—Staint. Man. i. 145.

Common.

App.—July and August.

This pretty insect is found throughout the area assigned to our local *Fauna;* and is commonly known as the "Garden Tiger," from the similarity of markings on its wings to those on the skin of the Tiger.

125. **A. villica,** *Lin.*

Phalæna villica, Lin. Sys. Nat. ii. 820.—Wood. Ind. Ent. t. 7, fig. 70.
Arctia villica, West. & Hum. Brit. Moth. i. 95, pl. 19, fig. 9-10.—Staint. Man. i. 145.

Common.

App.—May and June.

This very handsome species occurs in most places within the line of our district. It is not quite so common an insect as *A. caja*, that insect, though usually found singly, is more generally distributed; but the somewhat gregarious habit of *A. villica* causes it to be captured in numbers, making it, as far as specimens prove, nearly as plentiful as *A. caja.*

Gen. **PHRAGMATOBIA,** *Steph.*

126. **P. fuliginosa,** *Lin.*

Phalæna fuliginosa, Lin. Sys. Nat. ii. 836.—Wood. Ind. Ent. pl. 7, fig. 72.
Phragmatobia fuliginosa, West. & Hum. Brit. Moth. i. 93, pl. 19, fig. 1-2.—Staint. Man. i. 146.

Not uncommon.

App.—May and August.

Loc.—Hoe, Plymouth; Bovisand; Ermington; Ivybridge; Cornwood; Whitsand Cliffs; Saltash; Liskeard;—Torquay, *R. B. R.;* Fordlands, Exeter, *E. P.;* Barnstaple, *G. F. M.;* Falmouth, *Faun. Fal.*

Gen. **SPILOSOMA,** *Steph.*

127. **S. menthastri,** *Schiff.*

Bombyx menthastri, Schiff.-Mull. Wern. Verz. 54.—Wood. Ind. Ent. t. 7, fig. 73.
Phalæna lubricepeda, Lin. Sys. Nat. ii. 829.
Spilosoma menthrastri, West. & Hum. Brit. Moth. i. 91, pl. 18, fig. 12-14.—Staint. Man. i. 147.

Not uncommon.

App.—May and June.

Loc.—Plymouth; Plymstock; Kingsbridge; Cornwood; Tavistock; Cotehele; Liskeard;—Torquay, *R. B. R.*; Exeter, *E. P.*; Barnstaple, *G. F. M.*; Falmouth, *Faun. Fal.*

128. **S. lubricepeda,** *Lin.*

Phalæna lubricepeda, Lin. Sys. Nat. i. 505, ed. 10th.—Wood. Ind. Ent. pl. 5, fig. 76.
Spilosoma lubricepeda, West. & Hum. Brit. Moth. i. 92, pl. 18, fig. 17-19.—Staint. Man. i. 148.

Abundant.

App.—June and July.

A very common insect in almost every garden throughout Devon and Cornwall; where, during the later summer months, the larvæ are great pests to the cultivators of plants.

Gen. **DIAPHORA,** *Steph.*

129. **D. mendica,** *Lin.*

Phalæna mendica, Lin. Faun. Suec. 1127.—Wood. Ind. Ent. pl. 7, fig. 77-78.
Cycnia mendica, West. & Hum. Brit. Moth. i. 92, pl. 18, fig. 20-22.
Diaphora mendica, Staint. Man. i. 148.

Not common.

App.—May.

Loc.—Lipson; Catte-down; Crabtree; Plympton; Bovisand; Whitsand Cliffs; Saltash;—Torquay, *Dr. B.*; Exeter, *E. P.*; Barnstaple, *G. F. M.*

A marked characteristic of this species is that of the male being black and the female white. It is not so plentiful in the vicinity of Plymouth as it has been in past years.

Gen. **CALLIMORPHA,** *Lat.*

130. **C. Jacobææ,** *Lin.*

Phalæna Jacobææ, Lin. Sys. Nat. ii. 839.—Wood. Ind. Ent. t. 8, fig. 91.
Callimorpha Jacobææ, West. & Hum. Brit. Moth. i. 98, pl. 19, fig. 20-21.—Staint. Man. i. 148.

Very plentiful.

App.—May, June, and July.

A species that occurs freely all over Devon and Cornwall.

Gen. **DEIOPEIA,** *Steph.*

131. **D. pulchella,** *Lin.*

Phalæna pulchella, Lin. Sys. Nat. ii. 884.—Wood. Ind. Ent. pl. 8, fig. 95.
Deiopeia pulchella, West. & Hum. Brit. Moth. i. 99, pl. 20, fig. 1-2.—Staint. Man. i. 150.

Very rare.

App.—June.

The only authority for admitting this insect into the list of Devonian and Cornish *Lepidoptera* is that of Mr. Parfitt, of Exeter, whose note, concerning its being indigenous to the County of Devon, is on page 5256 of the "*Zoologist.*"

FAMILY—BOMBYCIDÆ, *Steph.*

Gen. **LASIOCAMPA,** *Schr.*

132. **L. Rubi,** *Lin.*

Phalæna Rubi, Lin. Sys. Nat. ii. 813.
Lasiocampa Rubi, Wood. Ind. Ent. t. 6, fig. 40.—West. & Hum. Brit. Moth. i. 57, pl. 11, fig. 1-4.—Staint. Man. i. 153.

Common.

App.—May and June.

Loc.—Bovisand Heights; Whitsand Cliffs; St. Cleer Down; Hingston Down; Bickleigh Down; Whitchurch Down; Torr, Cornwood;—Torquay, *R. B. R.;* Exeter, *E. P.;* Barnstaple, *G. F. M.;* Falmouth, *Faun. Fal.*

An inhabitant of high situations, where, however, the caterpillar is protected from the cold winds by the furze bushes and its own thick hairy pile.

133. **L. Trifolii,** *Schiff.*

Bombyx Trifolii, Schiff.-Mull. Wern. Verz. 57.
Lasiocampa Trifolii, Wood. Ind. Ent. pl. 6, fig. 41.—West. & Hum. Brit. Moth. i. 58, pl. 11, fig. 5-7.—Staint. Man. i. 153.

Local.

App.—August.

Loc.—Whitsand Cliffs; Penlee;—Bovey Heathfield, *E. P.*; Torquay, *Dr. B.*

In 1854-5-6, the larvæ of this local *Bombyx* were very abundant along the cliffs at Whitsand Bay, from Rame Head to Sharrow Grotto; but now, great difficulty is experienced in finding even an example in habitats where it was no task formerly to obtain a hundred. The cause of this scarcity was the systematic collecting of this larvæ by local Lepidopterists, for the 2000 other British collectors of insects.

134. **L. Quercus,** *Lin.*

Phalæna Quercus, Lin. Faun. Suec. 1106. Sys. Nat. ii. 814.
Bombyx Quercus, Wood. Ind. Ent. t. 6, fig. 43.
Lasiocampa Quercus, West. & Hum. Brit. Moth. i. 58, pl. 11, fig. 13.—Staint. Man. i. 153.

Var. *a. Bom. Roboris,* Schr. Faun. Boic. West. & Hum. Brit. Moth. i. 58, pl. 11, fig. 13.

Var. *b. Las. Callunæ,* Palmer.—Zool. 1656.

Var. *c. Bom. Spartii,* Hüb. Bo. pl. 39, fig. 173.

Var. *d. Las. Quercus,* Var. West. & Hum. Brit. Moth. i. 58, pl. 11, fig. 9-13.

Common.

App.—July and August.

Occurs from east to west, and from north to south, of both Devon and Cornwall.

Gen. **ERIOGASTER,** *Germ.*

135. **E. lanestris,** *Lin.*

Phalæna lanestris, Lin. Sys. Nat. ii. 815.
Eriogaster lanestris, Wood. Ind. Ent. t. 6, fig. 47.—West. & Hum. Brit. Moth. i. 52, pl. 10, fig. 3-4.—Staint. Man. i. 154.

Common.

App.—February and March.

Loc.—Torquay, *Dr. B.*; Exeter, *E. P.*; Axminster, *Z. J. E.*; Barnstaple, *G. F. M.*; Falmouth, *Faun. Fal.*

The geographical distribution of this species appears not to be continuous; for while it is "not uncommon" in the neighbourhood of Falmouth, "common" at Axminster, and "abundant" near Barnstaple, it has not hitherto been observed in the immediate district of Plymouth.

Gen. **PŒCILOCAMPA,** *Steph.*

136. **P. Populi,** *Lin.*

Phalæna Populi, Lin. Sys. Nat. ii. 818.
Pœcilocampa Populi, Wood. Ind. Ent. pl. 6, fig. 46.—West. & Hum. Brit. Moth. i. 54, pl. 10, fig. 7-8.—Staint. Man. i. 154.

Not uncommon.

App.—November and December.

Loc.—Plymouth; Bovisand; Kingsbridge; Ivybridge; Bickleigh Vale; Plympton;—Torquay, *Dr. B.*; Exeter, *E. P.*; Barnstaple, *G. F. M.*

The *imago* of this species is commonly taken at suburban gas lamps.

Gen **TRICHIURA,** *Steph.*

137. **T. Cratægi,** *Lin.*

Phalæna Cratægi, Lin. Sys. Nat. ii. 823.
Trichiura Cratægi, Wood. Ind. Ent. pl. 6, fig. 45.—West. & Hum. Brit. Moth. i. 56, pl. 10, fig. 13-14.—Staint. Man. i. 155.

Uncommon.

App.—September.

Loc.—Plymouth;—Torquay, *R. B. R.*; Exeter, *E. P.*

Like *P. Populi,* this insect is allured, at nightfall, by bright lights; hence it is captured in a similar manner as that species.

Gen. **CLISIOCAMPA,** *Curt.*

138. **C. neustria,** *Lin.*

Phalæna Neustria, Lin. Sys. Nat. ii. 818.
Clisiocampa Neustria, Wood. Ind. Ent. pl. 6, fig. 50.—West. & Hum. Brit. Moth. i. pl. 10, fig. 11-12.—Staint. Man. i. 156.

Not common.

App.—July and August.

Loc.—Efford, Plymouth; Longbridge; Plym-bridge; Western-Mills; Liskeard;—Torquay, *Dr. B.*; Exeter, *E. P.*; Barnstaple, *G. F. M.*; Falmouth, ***Faun. Fal.***

Except at Barnstaple, this insect is nowhere, in Devon and Cornwall, as common as it is in the south-eastern counties of England.

Gen. **ODONESTIS,** *Germ.*

139. **O. potatoria,** *Lin.*

Phalæna potatoria, Lin. Sys. Nat. ii. 813.
Odonestis potatoria, Wood. Ind. Ent. t. 6, fig. 52.—West. & Hum. Brit. Moth. i. 56, pl. 10, fig. 15-17.—Staint. Man. i. 157.

Common.

App.—July and August.

Distributed over the whole area of Devon and Cornwall.

Gen. **GASTROPACHA,** *Och.*

140. **G. quercifolia,** *Lin.*

Phalæna quercifolia, Lin. Sys. Nat. ii. 812.
Gastropacha quercifolia, Wood. Ind. Ent. t. 6, fig. 53.—West. & Hum. Brit. Moth. i. 60, pl. 12, fig. 4-7.—Staint. Man. i. 157.

Rare.

App.—July.

Loc.—Exeter, *E. P.*

Exeter is the only locality, within the limits allotted to our local *Fauna*, that has yielded this fine insect.

FAMILY—ENDROMIDÆ, *Steph.*

Gen. **ENDROMIS,** *Och.*

141. **E. versicolora,** *Lin.*

Phalæna Versicolora, Lin. Sys. Nat. ii. 817.
Endromis Versicolora, Wood. Ind. Ent. pl. 6, fig. 38.—West. & Hum. Brit. Moth. i. 79, pl. 17, fig. 1-3.—Staint. Man. i. 159.

Rare.

App.—April.

Loc.—Torquay, *Dr. B.*; Barnstaple, ("?"), *G. F. M.*

This splendid insect is very local and rare, occurring only within the range of our local *Fauna*, at Torquay. The Barnstaple locality, although cited advisedly, is not an authenticated habitat for *E. Versicolora*, as no actual capture of that insect has hitherto been made. Mr. G. F. Matthews writes:—"I have seen, what I believe was this insect, several times on the wing in a birchwood in the neighbourhood of Barnstaple."

FAMILY—SATURNIDÆ, *Staint.*

Gen. **SATURNIA,** *Schr.*

142. **S. Pavonia-minor,** *Lin.*

Phalæna Pavonia-minor, Lin. Sys. Nat. ii. 810.—Wood. Ind. Ent. t. 6, fig. 39.—West. & Hum. Brit. Moth. i. 51, pl. 10, fig. 1-2.—Staint. Man. i. 160.

Common but local.

App.—May.

Loc.—Bovisand; Whitsand Cliffs; Roborough Down; Bickleigh Down; Hingston Down;—Torquay, *Dr. B.;* Haldon, *E. P.;* Coddon Hill, Barnstaple, *G. F. M.*

This fine and handsome bombyx is found in Devon and Cornwall chiefly on elevated heaths and downs; the larvæ feeding on the heather *Calluna vulgaris;* while in the vicinity of London and the "Home" counties the larvæ revels in osier-beds, feeding upon various varieties of *Salix.*

FAMILY—PLATYPTERIGIDÆ, *Steph.*

Gen. **CILIX,** *Leach.*

143. **C. spinula,** *Schiff.*

Geometra spinula, Schiff.-Mull. Wern. Verz. 64.
Cilix compressa, Wood. Ind. Ent. t. 26, fig. 757.
Cilix spinula, Staint. Man. i. 162.

Not rare.

App.—August.

Loc.—Greenbank; Townsend Hill; Bickleigh Vale; Ivybridge; Cornwood; Kingsbridge;—Torquay, *Dr. B.;* Exeter, *E. P.;* Barnstaple, *G. F. M.*

Gen. **PLATYPTERYX,** *Lasp.*

144. **P. lacertinaria,** *Lin.*

Phalæna lacertinaria, Lin. Sys. Nat. ii. 860.
Platypteryx lacertula, Wood. Ind. Ent. t. 26, fig. 751.
Platypteryx lacertularia, Staint. Man. i. 162.

Rare and local.

App.—July.

Loc.—Bickleigh Vale ;—Torquay, *Dr. B.;* Exeter, *E. P.;* Axminster, *Z. J. E.*

Gen. **DREPANA,** *Schr.*

145. **D. falcataria,** *Lin.*

Phalæna falcataria, Lin. Sys. Nat. ii. 859.
Drepana falactaria, West. & Hum. Brit. Moth. ii. 83, pl. 74, fig. 4-5.—Staint. Man. i. 163.

Rare and local.

App.—July.

Loc.—Radford Wood, Hooe ;—Torquay, *Dr. B.;* Exeter, *E. P.;* Axminster, *Z. J. E.;* Bickleigh, *Mr. J. S. Dell.*

146. **D. hamula,** *Schiff.*

Geometra hamula, Schiff.-Mull. Wern. Verz. 64.
Drepana hamula, Wood. Ind. Ent. t. 26, fig. 754.—Staint. Man. i. 164.

Var. *b. Drepana uncula,* Wood. Ind. Ent. t. 26, fig. 755.

Rare and local.

App.—July.

Loc.—Torquay, *Dr. B.;* Axminster, *Z. J. E.*

147. **D. unguicula,** *Hub.*

Bombyx unguicula, Hub. Bo. t. 12, fig. 48.
Drepana unguicula, Wood. Ind. Ent. t. 26, fig. 756.—Staint. Man. i. 164.

Rare and local.

App.—June.

Loc.—Greenbank, Plymouth ;—Bickleigh, *Mr. J. S. Dell.*

Of the six species belonging to this family, five are included in the

Fauna of Devon and Cornwall. Except *C. Spinula,* none are common insects; and one *D. unguicula* has only been noticed once.

FAMILY—PSYCHIDÆ, *Bois.*

Gen. **FUMEA,** *Haw.*

148. **F. nitidella,** *Hub.*

Tinea nitidella, Hub. T. t. 1, fig. 6.
Fumea nitidella, Steph. Ill. Haust. ii. 82.—West. & Hum. Brit. Moth. i. 83, pl. 16, fig. 10.—Staint. Man. i. 167.

Common.

App.—July.

Loc.—Hoe, Plymouth; Staddon Heights; Mount Edgcumbe; Whitsand Cliffs;—Exeter, *E. P.*

The larvæ of this insect lives in a case made of pieces of dried grass, woven together somewhat after the manner of the caddis worms *(Phryganea).*

This, Part II of the Catalogue of Lepidoptera of Devon and Cornwall, is completed on this page; and contains synonyms, references, and habitats, of 96 species of Moths belonging to the SPHINGINA and BOMBYCINA.

The two counties are what may be termed rich in species, in contrast with most districts of England of a similar extent.

The Sphinges and Bombyces hitherto discovered in the British Isles number 143 species, and of these Devon and Cornwall yield 96; thus showing the high proportion of 8-12 of the whole British species, belonging to these two divisions of the Lepidoptera, to be included in the Devonian and Cornish *Fauna.*

ON THE LETTER ‘R.’

BY R. F. WEYMOUTH, M.A.

Though a great deal has been written on the subject of the present paper, there yet remain several particulars which seem to deserve fuller discussion, and to which, without further preface, I propose now to direct attention.

The first point to be noticed is that as in Tamul there are three *r*s, as in Hindostani, Armenian, and several Slavonic dialects, there are two, so also we have two in English. Any one who pronounces the word *rear*, will recognize the fact that the *r* before a vowel is more forcibly sounded than the *r* following a vowel; and when we pronounce *courier* or *prove*, we perceive that the *r* between two vowels, or following a mute has a sound which an Englishman rarely or never gives it at the end of a syllable. In these words we "roll the *r*." The existence of these two sounds in English is recognized by Ben Jonson in his English Grammar, where he says "*R* is the *dogs* letter, and hurreth in the sound; the tongue striking the inner palate with a trembling about the teeth."

But there is yet a third sound with which our ears cannot be altogether unfamiliar, that of the *r* as pronounced by the Parisians and in many other parts of France. Here the tongue does not vibrate, but the sound proceeds, at least chiefly, from the throat. Indeed, so decided a guttural is this French *r*, that Mons. De la Villemarqué uses it with the addition of '*h* to represent the Celtic *ch*. In his Breton Poems he gives the names Tudvoulch and Kevoulch in his translation as Tudvoulr'h and Kevoulr'h, and Unhwch as Unour'h. (Bardes Bretons, pp. 269, and 39.) It is apparently of the same sound that

Mr. Garnet is speaking, when he says that "in Northumberland and some parts of Germany, the sound meant for *r* has no lingual vibration at all, but becomes a deep guttural, neither very easy to describe nor to imitate, but almost exactly corresponding to the Arabic *ghain*."*

The following observations however concern almost exclusively the two sounds which we have in English, and which in this paper will be distinguished as the *vibrant r* and the *non-vibrant r*.

In considering what place *r* ought to occupy in a well-classified alphabet we must not lose sight of this distinction between the vibrant and the non-vibrant *r*. It is doubtless of the latter that one of our most advanced English scholars has said that he knows not how to distinguish it as other than a vowel. Let us briefly examine this point.

We all know there are certain sounds which grammarians recognize as vowels, others which are called consonants, though definitions of these terms are rarely met with. According to the distinction implied in the words themselves, a vowel can be sounded by itself, while a consonant can only be "sounded with" a vowel. But *s*, *sh*, *th* surd, *th* sonant, *r*, &c., can be perfectly sounded without any vowel; and if on these definitions *r* becomes a vowel, so must all these others.

Or shall we, with Dr. Latham, define a vowel as a sound in the formation of which "the passage of the breath is uninterrupted"? Again the non-vibrant *r* becomes a vowel; but so does *l*, in the formation of which the passage of the breath is not interrupted, though it is restricted; and *m*, in which the breath passes uninterruptedly through the nose, though restricted to that exit. Nor can we escape this difficulty by varying the above definition and substituting "unrestricted" for "uninterrupted," as no sounds whatever pass from the human mouth without some restriction or limit: even the most open vowels are denied egress through the nasal cavity, which, as I have shown elsewhere,† is open only to *m*, *n*, *ng*.

The definitions which I venture to propose, are the following:— A vowel is a simple sound produced by the passage of the breath through the mouth, its character depending on the position of the tongue and lips, which organs remain *passive* during the utterance of the vowel; and such sound, if prolonged, is capable of independent use as a word. A consonant is a simple sound emitted from the mouth alone or the mouth and nose, and resulting from some *pressure* or other *action* of the vocal organs; such sound always preceding or following a vowel, and being incapable of being used as a word by itself. If these definitions are accepted, it will follow that *r*, whether *vibrant* or *non-vibrant*, is not a vowel, but must remain where it has been placed by, I believe, every grammarian who has ever written, among the consonants. The vocal organs are rather active than passive during the utterance of the *r*; and it is always used either before or after a vowel, never as a word by itself.

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* Phil. Soc. Proc., Vol. III, p. 111.

† See Transactions of the Philological Society for 1856, p. 21.

The non-vibrant *r*, however, like two other letters which we are accustomed to regard as consonants, the *w* and *y*, though it possesses most of the characteristics of a consonant, does not, as prolonged, result from any very distinct action of the vocal organs. In sounding the *y*, there is an approximation of the back part or body of the tongue to the back part of the palate, but scarcely more than in sounding the vowel *e*. In sounding the non-vibrant *r*, there is a precisely similar approximation of the tip of the tongue to the centre of the palate. In sounding the *w*, there is an approximation of the lips to each other, but hardly more than in sounding the vowel *oo*. Yet in all these cases at the moment of transition to a following vowel, there is a more decided pressure, and a distinct action, of the organs. We can easily recognize such action even where the *y* is followed by its cognate vowel, as in *year* (compare *ear*), or the *w*, as in *wooes* (compare *ooze*); and precisely similar action takes place in *ray* and *robe*, provided the *r* is not rolled. Now suppose these three sounds respectively to follow their vowels instead of preceding them. Then we find them pronounced so feebly that one can hardly affirm there is any distinct action of the vocal organs. At present we make no distinction in the pronunciation of the diphthong in *boy* and *noise*, or between the *ow* of *how* and the *ou* of *house;* yet it is possible that when the fashion was first established of writing a final *y* or *w* in these diphthongs rather than *i* or *u*, there may have been a quasi-consonantal force in the closing sounds, which is now lost. The *r*, however, though feebly sounded, yet maintains its existence even in this position; for Dr. Guest's statement, unless he refers to the vicious pronunciation of uneducated Londoners, is certainly not accurate, when he says, "In his ordinary conversation the southern Englishman never pronounces a final *r*, unless it is followed by a vowel," while he acknowledges that even a Londoner would do so "if his attention were alive upon the matter."*

There are however so many points of similarity between the *non-vibrant r* and the *w* and *y*, and they all three so closely approach the nature of vowels, resembling these in formation, while they resemble consonants in their use, that they seem to have a better claim than any other letters to the name of *semivowels*, by which I shall speak of them henceforth. Their proper order, as arranged on the principle of beginning from the throat and advancing along the palate to the lips, will be *y*, *r*, *w*.

But *r* is commonly spoken of as a *liquid*, a name which it, in common with three or four other simple sounds, bears to indicate the facility with which it may be pronounced with other consonants. We have in English 21 such combinations of *r* with other simple consonants; and certain others, though difficult to an English mouth, are yet not impossible. We cannot readily pronounce *mr* in one syllable, nor could the ancient Greeks pronounce these letters together even in two syllables, and so the Hebrew נמרד (Nimrod) becomes Νεβρωδ in the Septuagint, and ממרא (Mamre) becomes Μαμβρῆ; but in Sanskrit we meet with *mri*, to die, *mrig*, to seek, *mrî*, to injure, &c. So we have *nr* in *nrit*, to dance; *jr*, in *jrî*, to grow old; *chr*, in *chrit*, to hurt; *sr*. in *srî*, to injure.

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* Phil. Soc. Proc,, Vol. III, p. 7.

Nor is the combination of *r* with the aspirate to be forgotten, though in modern English we entirely disregard the *h* in *rheumatism*, *rhinoceros*, &c. The mere spelling of Latin words derived from the Greek is sufficient evidence that something like an aspirate followed the initial ρ in Greek; and in Welsh this is the case with all radicals. But while in the Welsh schools great pains are taken in instructing children to insert this *h*, and to pronounce it in the proper place, viz., after the *r* and not before it; our Anglo-Saxon forefathers always put the aspirate before the *r*. Whether in Greek words beginning with ῥ the aspirate preceded or followed the *r*, will admit of doubt. If we may trust the Roman ear—which was accurate enough in the case of *rheda* from the Welsh *rhedeg*—the aspirate followed; but there is perhaps some force in the argument of Dr. De Lagarde: "Lingua Græca cum Armenica id habet commune, ut initio vocabulorum literam caninam non ferat. Ea igitur vocabula quæ apud Indos literam *r* habent primam, apud Græcos aut vocalem aliquam præmittunt (velut *rudhira* ἐρυθρός) aut *r* in *l* mutant (velut *ric* linquere λιπ, *ruc* lucere λευχός). Ea autem quæ apud lexicographos Græcos ante σ in unum agmen coacta habentur, non *r* habent primum, sed spiritum asperum, eumque aut pro *w* aut pro *s* positum." (Tit. Bost. contra Man., præf. pp. 6, 7.)

In proceeding to consider the use of the letter *r*, we may notice first the tendency to insert it after the short *a* when another vowel follows, as in Rosa*r* Evans. Now this paragogic *r* is found most frequently when the next word begins with a vowel, and this perhaps will help us to account for it. Displeasing as this *r* is to an educated ear, it is only so by virtue of its associations; it is as true a euphonic insertion as any that exists. A person is intending to say "One window of the house." He mispronounces *window*, as uneducated persons often do, as *winda*. *Of* follows, pronounced *uv*. Two precisely similar vowel sounds come together, and a pause or hiatus between them offends the ear: for it *is* offensive to the ear, though in what we call "correct" speaking such an hiatus is not merely tolerated but carefully observed. Our speaker however knows little of Nares, Sheridan, or Walker, and he lifts the tip of his tongue ever so little and the inconvenient gap between the vowels is at once occupied by an obliging *r:* "one winder of the house." Perhaps he even vibrates the tongue, and we have Ben Jonson's "dogs letter" in full force; but this, so far as my observation goes, is the exception rather than the rule, and the euphonic *r* is almost always the semi-vowel or non-vibrant letter.

I believe however that we shall find phenomena precisely analogous to this in the employment of the other semi-vowels—phenomena less noticeable, but not the less actual.

The pure vowel sounds of our language being the twelve which are exhibited in the following series of words—*cheap*, *chip*, *pate*, *pet*, *Sam*, *psalm*, *nought*, *not*, *nut*, *note*, *pull*, *pool*—the insertion of the euphonic *r* occurs most frequently by far when a word beginning with a vowel follows one ending in the ninth of these sounds, viz.: the *ă* of *Rosă*, *Musă*, &c., which is in pronunciation identical with the *ŭ* of *nut*. The *r* is also occasionally added after each of the middle pair of long vowels, as: "Is your *papar* upstairs?" "I am going to *drawr* on card." This addition sometimes takes place where the long vowel is followed by a consonant, as when the A.S. *lacan*, to play, gives origin to our word *lark* = sport, and when *St. Ann's Chapel*, in the neighbourhood of Plymouth, changes its name to *Turnchapel;* but in both of these cases the word seems to have been erroneously identified with another totally different.*

Returning therefore to the purely euphonic insertion of the *r*, we may notice that we have no words in the language which end in the *ĭ* of *pit*, the *ĕ* of *met*, the *ă* of *mat*, the *ŏ* of *not*, or the *ŭ* of *pull*, so we may pass these by. But turning to the long vowels we find again that no words end in the *pure* sound of *ā*, which we have only (if we have it at all) before *r*, as in *mare*. The sound of the long *ā* as a final (in which case we write it *ay*), or before any other consonant than *r*, is really diphthongal, as we close in the sound towards the end into *ē*. (This peculiarity of the English pronunciation has been nowhere more clearly stated than by Sophocles in his Romaic Grammar, where he represents our *fate* in Greek letters as φέϊτ, though doubtless he exaggerates somewhat in so doing).

Now let us observe what happens when an hiatus follows a word ending in the pure sound of *ē*, like *decree*, or in the diphthongal *ā-ē*, like *day*. Such an hiatus will exist whenever another *ē* or the *ĭ* follows such words; and in such cases, I think we shall find as strong a tendency to insert the semivowel *y*, as in "Maria Andrews" to insert the semivowel *r*.

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* I must leave it to those who are better versed than I am in the Semitic languages to deal with those Syriac and Samaritan words which contain an *r*, that is wanting in the cognate Hebrew forms. To such scholars, I would suggest the enquiry whether in such cases the earlier form is the one without the *r*, (as seems probable), or the other, and on what principle the insertion (or omission) can be accounted for.

Let us take first the simplest case of such hiatus. Ask a young child to spell *get*, and he will perhaps pronounce the three letters with the hiatus, *gee ee tee*; but it is much more likely that he will say *gee hee tee*, or *gee yee tee*. In like manner in forming the present participle of to *see*, to *pity*, there is a tendency unconsciously in speaking and especially in singing to compound *see* and *ing* into *see-ying*, *pity* and *ing* into *pity-ying*, and so on.

Let us now turn to the other end of the vowel system. Again, we have no words ending in the pure sound of *ō*, which (if we have it at all) is found only before *r*, as in *roar*. The final *ō*, or *ō* followed by any other consonant than *r*, closes into *oo* as *ā* does into *ē*. (Sophocles writes our *note* as *νόουτ*). If then we take words that end in the labial vowel *ōō*, as *accrue*, or in the diphthongal *ō-ōō*, like *lo*, *bow* (almost all of which are written with *ow*), and let another vowel follow, then we find the euphonic insertion—or at least the tendency to the insertion—of the third or labial semivowel *w* between these vowels. For instance *go out*, *go over*, are sometimes unconsciously pronounced by emphatic speakers as *gowout*, *gowover*; and in such a sentence as "the *true ousel* is the blackbird," there is as strong a *tendency* to say "true *w*ousel" as there is with some people to say Maria*r* Andrews. In like manner I have known a young lady who frequently corrected her young friends for calling her Lou-*w*isa, with one letter more than was agreeable to her ears.

An instance of the addition of this euphonic *r* has been suggested to me by a friend as found in the pronoun *her* when used for *she*. The A. S. feminine pronoun was *heo*, which was probably pronounced with the *e* as in *me*, and the *o* as in *move* (*hee-oo*). Of this dyssyllabic form sometimes one vowel was dropped, and sometimes the other, so that we find in Old English sometimes *ho* (or *hoo*), and sometimes *he* used in the sense of *she*. But when a word ends in *ōō* unaccented; or in *ō* (as has been remarked above), careless speakers are apt to shorten this into the *ă*, as sounded in *Americă*. This kind of change *hoo* (= she) appears to me to undergo, and after its metamorphose into *hă*, the adscititious *r* soon makes itself heard.

But by the side of the fact that it is this sound of *ă* (or *ŭ*) to which the *r* chiefly attaches itself, comes the peculiar power which *r* seems to possess in English, of changing other vowel sounds into this one, especially in unaccented syllables. Compare, for instance, the final syllables of *beggar*, *father*, *Nadir*, *author*, *murmur*, *satyr*. Nor is this the case only in final syllables. While I notice in boys a tendency to pronounce *conditional* as *kinditional*, *procuring* as *prĕcuring*, or *prĭcuring*, this change does not take place if the short vowel is followed by an *r*, as in *prorogue*, where it either retains its proper sound, or takes that of *ŭ*. Every one knows also that in such words as *particular*, *correction*, where the second syllable is accented, the first syllable is habitually pronounced by careless speakers as in *pertinent* or *curtailment*. (I do not speak of such words as *sardonic*, *largesse*, *tornado*, which are as yet hardly ever used but by educated persons). But even in fully accented syllables *r* exercises to a considerable extent the same influence on a preceding vowel. Few speakers among us—not being Scotch or Irish—make any distinction between *fir* and *fur*, *earn* and *urn*, &c. Can any further account be given of this fact?

This at least may be stated. If we attempt to sound either the vibrant or the non-vibrant *r* without a vowel, we can scarcely, if at all, do so. We almost unavoidably prefix a dull short vowel sound much like the French *e muet*, or the Sanskrit *ă*.* The mouth is already in just the position for this sound. If we sound *ear* or *Erith*, the tongue is more extended for the vowel than for the consonant, and must be drawn back. If we sound *oar* or *oration*, the lips are somewhat more protruded for the vowel than the consonant demands. In sounding *are*, the mouth is opened wider for the vowel than it is for the *r*. When, however, we sound *err*, *earnest*, *urge*, the only change requisite in passing from the vowel to the *r* is to raise the tip of the tongue a little, and in some instances to vibrate it. There is thus shown to exist a natural affinity between the vowel sound in question and the *r*.

We have above discussed the insertion of *r* in certain cases: it should also be noted, that in some few instances it has disappeared. Thus, in Devonshire, we hear at times *pretty* mutilated into *pootty*, which is apparently thus to be accounted for,—it being premised that Bosworth (s. v. *prœte*) gives sufficient evidence that the *r* here is radical. Now there is a strong tendency in the Devonshire dialect to change the places of an *r* and its following vowel—of which more anon. Thus we get *purty*. This metathesis effected, the *r* is dropped, simply, I suppose, because it is easier to pronounce a single consonant than two together; just as we omit the *l* in *calm*. *Pretty* is the only word, so far as I remember, in which the Devonshire dialect drops the vibrant *r*, but the non-vibrant *r* is omitted in many more, as *vust*, *bust*, for first, burst; *cuss*, *wuss*, for curse, worse; *vuz* for furze; *hoce*, *foce*, *scace*, *cooce*, for hoarse, force, scarce, course; *Thesday* for Thursday; *aith* and *weth*, for earth and worth, &c.

But again we have the vibrant *r* omitted in Fαγ-νυμι = *fra*(*n*)*g*-*o*, *break*, *brech-en*, &c.; *speech* = A.S. *spræc*, Germ. *Sprache*, &c. And so Livy and other Roman writers speak of the Ῥασένα by the name of *Etrusci* or *Tusci*, using these forms without distinction. That the latter of these has lost a radical *r* is shown by the Greek equivalents Τυῤῥηνοί, Τυρσηνοί, and yet more distinctly by the variety—and apparently the oldest form of the name—*Turscus*, as it is found in the Eugubine Tables. And *Bomilcar*, we are told, is equivalent to *Barmilcar* = A.S. Ætheling.

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* In thus alluding to these foreign sounds, I do not mean to imply that they are the precise equivalents of our *a* in *Rosa* and *beggar*: the *e* of the French *le renard venait* verges rather (though very slightly) towards our *oo*, and the *a* of *dharmma* towards our *ah*.

Lastly, in the Platt-deutsch and in Old Saxon we find *we* for *wer* and *de* for *der*, both as an article and a relative; as in Reineke de Vos,

> *De* koning sprak: *we* is so sot
> *De* Reinken dôr bringen dat dridde bod?

So akin to this *de* we have in A.S. both *se* and *þe*, and our *he* is the *her* of Tat. and *er* of modern German; but all these are merely instances of that abrasion which all terminations in the Indo-Germanic languages are constantly undergoing.

One characteristic of this consonant which has been frequently noticed is its tendency to change places with its attendant vowel. In the Devonshire dialect there are many instances of this, as *urn* for run, *urd* for red, *urch* for rich, *burches* for breeches, *curst* for crust, *Kursmis* for Christmas, *irt* for right, *girt* for great, *apern* for apron, *urdgment* for regiment, *firnt* for front, *purceed*, *pursarve*, *purvent*, *purmote*, *purtect*, for proceed, preserve, &c. So I suspect that the noun *rod*, in its various senses, with its by-form *rood*, also used in a variety of meanings, and the German *ruthe*, are all akin to the A.S. *gyrd*, *geard*, &c. = rod or staff, Germ. *gerte*, Dut. *gaard*, Friesic *gerd*, early English *yerd*, modern English *yard* (this being probably quite distinct from *yard*, as akin to *garden*, *hortus*, *court*, &c.); and that in *yard*, as compared with *rod*, we have another instance of the metathesis now under consideration. The loss of the semivowel *y* before the *r* is to be explained by the simple impossibility of pronouncing it, unless indeed it were vocalized into *i*; but in all the cases we are now considering, the change of pronunciation involves no change in the number of syllables. Or if the *g* of *gyrd* was pronounced as we now sound it in the verb to *gird*, the loss of the mute in *rod* is but analogous to the disappearance of the *c* in *repo*, as compared with the English *creep*.

The fact of this metathesis is not incapable of explanation, if at least we suppose that it is in every case the vibrant *r* that we are dealing with (and we have no evidence that a thousand or even five hundred years ago the non-vibrant *r* existed in our language); for if we pronounce the rough vibrant *r* in *yrnan*, *cirspan*, or *crisp*, *gars* or *grass*, &c., and pronounce it strongly, we at once find that this *r* will not admit of any other consonant so closely adhering to it, either before or after it, that there shall not be a brief vowel sound intervening. Sometimes (as in *run*, *i-ron*) this is the vowel which has been above shown to be nearest akin to the *r*. More commonly it is the vowel of the root which seems to prolong itself beyond the vibration. Thus we have a short vowel on each side of the *r*, but of these one or the other was commonly dropped, and at a certain stage of the language speakers and writers had in many cases the option of two forms.

An instance of this metathesis, which, I believe, has not been hitherto noticed, is perhaps furnished by the common provincial *childer* as plural of *child.* One form of the Anglo-Saxon plural was *cildru*, the final vowel of which—however it was pronounced—seems to have undergone the same change as that of *hoo* when passing into *her* = *she.* Thus the word comes to be written *childre*, as in Laȝamons Brut (or *chilldre*, as in the Ormulum) next *childere*, as also in Laȝamon, and then *childer*. Lastly, by the addition of *n* for O. E. *-en*, or A. S. *-an*, we get the two forms of the double plural *children* and *childern* (in Laȝ. *childerne*). In Dutch *kinderen* both vowels are retained. There are three other such double plurals found in Wiclif and Caxton—*calveren* (compare Dutch *kalveren*), *eyren*, and *lambren*; and it is worth noting, that the Anglo-Saxon *cealf* and *æg* both exhibit the unusual plural in *-ru*, as *cealfru* and *ægru* (or *ægeru*), and it is not improbable that a similar plural of *lamb*, though unknown to Bosworth, may yet have existed, since we have in the Ormulum

> "To stanndenn ȝæn þe laþe gast
> To werenn hise *lammbre*." (v. 13329.)

In passing on to the interchanges of *r* with other letters, we must first observe how readily of the two *r*s themselves one passes into the other. If we had once no non-vibrant *r* in the language, there can hardly be shown to be any instances of the non-vibrant *r* changing into the other. Of transition in the opposite direction, as when *iron* is pronounced *iurn*, instances are innumerable. And mere facility of pronunciation is sufficient to account for this. Whenever a vowel follows the *r*, the tongue must extend itself further than if no vowel follows; and a yet more arduous duty devolves upon that organ, if the rough *r* is to be pronounced. From this labour the English tongue is wont to shrink, as indeed even the initial *r* in ordinary conversation is commonly sounded by us without any vibration.

But let us now notice the substitution which we sometimes meet with of *w* for *r*. We may thus account for it. Through some organic defect, or from some other cause, the tongue is unable to effect that contraction of the vocal orifice by pressure of the tip of the tongue towards the palate, which is essential for the non-vibrant *r*, and still less is it able to maintain nearly the same position, and vibrate the tip at the same time. But in the very effort to do this the lips approach each other, a *w* being thus formed, and this semivowel is then accepted in place of the one that was intended, as an approximation to it.

Of greater interest on many grounds is the interchange of *r* and *l*.

This too is easy to account for. The only difference in the formation of these sounds is, that in the *r* the breath passes continuously, or with numerous momentary interruptions, over the tip of the tongue, and in the *l* it passes by the tongue on each side, the tip touching the palate.

This difference, though slight in itself, *we* can with perfect readiness both make with the tongue, and apprehend with the ear. But it is not so with all the members of the human family. Some of the South Sea islanders for instance are unable to distinguish these letters either in speaking or by the ear. A lady of my acquaintance, who lived for several years at Tahiti, had two little girls one named Mary and the other Emily. These names were a source of great embarrassment to the natives, who in pronouncing them made them both Amălă; with which we may compare the τραυλισμός ascribed to Alcibiades by Aristophanes (Vespæ, 45), ὁλᾷς for ὁρᾷς, and so on. We may also notice that in the early Welsh poetry a final *l* will very often rhyme with a final *r*; while in some parts of Spain, especially in Andalucia, these two liquids are pronounced so much alike as to be not unfrequently confounded by uneducated persons; thus they will write *terrol* or *tellor* for *terror*, *hollol* for *horror*.

The actual change of one of these letters into the other takes place frequently in immediate juxtaposition with that other; as the Sanskrit *târâ* shows that the *r* is radical in the English *star*, Gr. αστηρ, &c.; but when to this root the Latin diminutive termination *-la* is added, it is not *ster-la* or *ster-ula* that results, but *stella*. Sometimes the *l* is changed into *r* on account of the vicinity of another *l*, as in *familiaris* for *familialis*: but the presence of another *l* is not essential. We have no diminutive termination *-ly* in English, and Molly, Dolly, Sally, are formed by a direct change of the consonant from Mary, Dora, Sarah.

The Hebrew שרשרה (shar'sh'rāh), a chain, Chaldee שלשלה (shal'sh'lāh); ארמכות (ar'mānōth), palaces, later Hebrew אלמכות (al'mānōth),—and many more examples might be cited from the Semitic languages; the Grk. ἀργός, Lat. *albus*; φραγέλλιον as the New Test. form of the Lat. *flagellum*; the coexistent Latin forms *celeber* and *creber*, *linealis* and *linearis*; the Romance *citola* from Lat. *cithara*; *alblast*, an Old English corruption of *arbalast*, a crossbow (*arcubalista*); *palfrey*, Fr. *palefroi*, in medieval Latin *parafredus*; the Walachian *poporu* from the Latin *populus*, people; *Salisbury* as the modern form of *Sarisbury*;—all of these exhibit the same direct interchange of *r* and *l*.

The affinity of *r* and *l* being allowed as a well established fact, and being also easily accounted for physiologically, it is not difficult to see that *r* and *d* will also interchange. The latter consonant differs from *l* only in the lateral expansion of the tongue, to intercept the breath, which in the *l* is allowed exit on each side of the tongue.

The rest of the vocal organs are in precisely the same position in *d* as in *l*. Instances of this interchange have been found in *reed*, Germ. *rohr; goad* and *gore; audio* and *auris; adbiter* as the original form of *arbiter;* &c.

We pass on to the interchange of *r* with *n*, of which there are many instances. One worth noting is that of the name of the great king of Babylon, whom the Hebrews, as in their books of the Kings and Chronicles, commonly called Nebuchadnezzar, but the prophets Jeremiah and Ezekiel generally Nebuchadrezzar. The latter is said to be the Aramaic form, though this seems very doubtful, as in those parts of the book of Daniel which are written in Chaldee, Nebuchadnezzar is alone used. The form with *r* is however proved to be the original by the recent discoveries in Babylon, where every brick of this king's palace bears a name read by Sir Henry Rawlinson as Nabu-kuduri-uzur.

The change from *r* to *n* (or the contrary) is greater than from *r* to *d* in one respect, namely, in *n* the velum palati is lowered. But the lips are still open, the vocal chords vibrate, and the tongue remains still in precisely the same position in contact with the palate. Hence there is not only a ready substitution of *r* for *n* (or the contrary), but an equally ready transition from the *r* to the *n*, so that occasionally words ending in *r* assume an *n*. Examples of this accretion are the modern Greek δέρνω, to beat, from the ancient δέρω; and the O. English *cittern* or *zithern*, from Grk. κίθαρις, Lat. *cithara*, Span. *citara* and *guitarra*, Ital. *citara* and *chitarra*, &c.

The next interchange to be noted is that of *r* and *s*, or *z*. And here I would note at the outset that in numerous instances, where an *r* has become *s*, or the contrary, the *s* has the sound of *z*: it is the sonant, not the surd sibilant. So the *r* in *broom*, Dutch *brem*, is represented to the eye by an *s* in *besom*, but to the ear it is a *z*, and nearly so in the German *besen*: in Dutch also there is the form *bezem*. The *r* in *hare*, Dan. *hare*, is a *z* in the Dutch compounds *hazejagt*, hare-hunting, and *hazekop*, head of a hare; and such almost is the pronunciation of the Ger. *hase*. So it is *z* that is interchanged with *r* in *teaze* and *teazle* as compared with *tear*; *sneeze* with *sneer*; *glaze* with *glare* and *glaire*, Lat. *clarus*, Engl. *clear*; *blare* with the Dutch *blazen*, Germ. *blasen*, and the Engl. *blazon* and *blazonry*; *frore* with *frozen*, Germ. *gefroren*; and the Lat. *ar-idus* with the Greek αζ-αλεος (and αζ-ηχης ?)[*] in which there is apparently the same root, though we need not suppose the ancient Greeks, like their modern descendants, to have pronounced their ζ exactly like our *z*. And again, it is the sound of *z* in *nose* which is represented by the *r* of the Lat. *nares;* in *raise*, of which *rear* is but another form, as *araise* of *arear* in early English; in *lose*, of which *verlieren* is the German equivalent, and from which we have in English the compound participle *forlorn*, utterly lost, Germ. *verloren;* in the verb *is* (where the *s* is not a termination as in *he loves*, but a radical), plural *arne* and *are;* in *was*, O. E. *wes*, plural *ware*(*n*) or more commonly *weren* or *were*, though we not unfrequently, in provincial dialects, have the *r* even in the singular, as always in the subjunctive. Nor is it only in English (and German) that *s* often stands for the sound of *z*; it is always so in French, and most frequently in Italian, if the *s* comes between two vowels; and in all probability this was also the case in Latin and Greek. Hence in those early Latin forms in which an *s* stands for a later *r*, the single *s*—pronounced as a sonant—seems to have been used almost exclusively. Such forms are *Fusius* = *Furius*, *Maso* = *Maro* (= mason ?), *læbesum* = *liberum*, *plorasit* = *plorarit* = *ploraverit*, *ocisit* = *occirit* = *occiderit*, *verbesit* = *verberit* = *verberarit*, *plusimus* = *plurimus*, &c.*

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[*] Compare Il. 13. 409, with 17. 741.

Now any one who chooses to sound the vibrant *r* and then the *z*, or vice versa, will readily perceive that the transition involves no very considerable change in the position of the vocal organs. But a curious illustration of the affinity of these two sounds has come under my notice in the case of a former pupil of mine, who, when a little boy, was quite incapable of distinguishing them in his pronunciation. I have frequently, when he was about eleven years old, made him stand by my side and pronounce words containing these sounds; and as he tried word after word, I have found myself quite unable to determine whether the singular sound he produced was more like *rose* or *roar*, *Cæsar* or *Cærar*.

The surd sibilant *s* is one step more remote from the *r* than the *z* is, inasmuch as in the *s* the vocal chords of the larynx apparently cease to vibrate. But as it is impossible always to decide in ancient languages whether the sibilant with which we may be dealing was pronounced as a surd or as a sonant, we may disregard the distinction in quoting a few other instances. Such are the σ in *αἴσυμνα* as representing† the *r* of *ærumna;* the corruption of the classical *Busta Gallica* into *Portogallo;* the use of *r* as a nominative termination in Old Norse, the corresponding termination in Latin and Greek being *s* (e. g. blind*r* = cæc*us*); the use of *r* in Irish as the termination of the second person singular of verbs, corresponding to the *s* of the pronominal suffix in Sanskrit, Greek, Latin, Old German, &c.; the formation of certain genitives in ***r***, the usual genitive termination in the Indo-Germanic languages being *s* (e. g. Germ. des, *der*, des; A. S. his, *hire*, his; our, your, their, alle*r*); and the formation of plurals in *r* in German, and yet more commonly in the Scandinavian languages, and in some cases in Anglo-Saxon, from which there survives one instance (childer) in provincial English, as compared with the ordinary formation in Anglo-Saxon, (Mœso-Gothic), English, French, Latin, Greek, &c. of plurals in ***s***.

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* A very different mode from the one here suggested, of accounting for the consonantal change now under notice is implied in the supposition that "*r* was perhaps originally like English *th* in *those*" (see Elementary Lat. Grammar, by Mr. Roby, of St. John's, Cambridge, p. 2). The point is not argued; but to establish so remarkable an hypothesis, it would seem to be necessary to show at least one nation employing this same Hebrew-derived symbol R to stand for the sound of *th* in *those*, and equally necessary to find numerous cases in which *r* has been changed into this *th*, or *vice versa*. Such evidence will be very hard to adduce.

† So Mr. Paley conjectures: see his note on Eur. Med. 19.

But there is one word that claims special attention. In the late Mr. H. Coleridge's "Glossarial Index" occurs the word *chere*. It is from Rob. Glouc, p. 166, that he quotes the expression "the *chere* men of the land," which, with Hearne, he explains as = "the *high* men of the land": I believe the true meaning is "the *chosen* men." Of the rejection of the participial termination -*n* many examples will be found in a paper by Dr. Guest in the Proceedings of the Philological Society, Vol. II, p. 197. Nor is there much difficulty in accounting for the *e* instead of the *o* which we have in *chosen*, so numerous are the double forms which we find in various stages of English, such as *clothe* and *clethe*, *broad* and *brede*. And so where, as in *chere*, an *r* follows; as *bor* = *beer* (Owl and Nightingale), *more* (West*more*land) = *mere*, *ȝorne* = *ȝerne*, *swore* = *swere* (= neck), *lere* = *loss*. None of these is indeed a participle, though the last quoted closely approaches one in sense; but the *o* would perhaps so much the more readily become an *e* in the past participle of this verb as the preterite tense was always *ches* (like *les* from *lose*). As to *s* for *r* in this case, we may compare the German *erkiesen*, part. *erkoren*, and A. S. *ceósan*, part. *gecoren*. The usual Early English form is *i-coren*, as in the Castle of Love (Vernon MS.):—

Carfuliche he haþ *i-coren*.

(*R* and 𝔷.) Now let us revert to the condition of those unhappy Frenchmen who virtually have no *r* in their language. Is it possible to throw any light on their case? I am not prepared to discuss this subject fully, but will just throw out one suggestion based on the following passage in Palsgrave's Lesclarcissement. "R in the frenche tonge, shalbe sounded as he is in latyn without any exception, so that, where as they of Parys sounde somtyme ***r*** like ***z***, sayeng *pazys* for *parys*, *pazisien* for *parisien*, *chaize* for *chayre*, *mazy* for *mary* and suche lyke, in that thyng I wolde nat have them folowed, albeit that in all this worke I moost folowe the Parisyens and the countreys that be conteygned betwene the ryver of Seyne and the ryver of Loyrre." (Lesclarc. p. 34.) (I shall take for granted that in speaking of *z* here, Palsgrave sounded that letter as a sonant as we now do, though such forms as *plaintz*, *spiritz*, *maundementz*, in 14th century writers, and *porz* = *ports* in Laȝ. Br., make it highly probable—to say the least—that at an earlier period our ancestors sounded this letter like *ts*, as the Germans do now). So here we have this change of *r* into *z* taking place on a large scale: a considerable portion of the French nation by common consent effecting this change. And our observant countryman detects them in the act: they do this "somtyme." May it not be that this "somtyme" gradually expanded into "all way," and then from this *z* the sound passed—by a sufficiently easy transition—into that deep guttural which the Parisians pronounce now whenever they name their native city? Of course it may be objected that Palsgrave described the same sound which we now hear from a Parisian as a kind of *z*; but he does not say "a kind of *z*," or use any such qualifying phrase; and he was a man accustomed to note pronunciation very closely. Moreover there is at least one word in the language which testifies in his favour. From the Greek and Latin *cathedra* comes the French *chaier*, *chayere*, *chaire*. This in Palsgrave's time appears to have been the form of the word, and from this our *chair* is derived; but one pronunciation of the word was—so it would seem—*chaize*, and this form has now driven the earlier one altogether out of the French language. Itself only used in the sense of *pulpit* in the latter part of the 17th century (see Cotgrave), it has now altogether supplanted the older *chaire*. The existence of the word in its present form increases the probability of the accuracy of Palsgrave's observation. But if he can be shown to be in error, and no *z* ever existed as a stepping-stone between the true sound of *r* and the present guttural; the Hebrew language will at least furnish a parallel instance in such a pair of words as מרט (m'rat) and מעט (māghat) = he polished, there not being—so far as I am aware—any intermediate form with ז as the second radical and claiming kindred with these two.

Nor must it be forgotten that this Parisian "burr" is nearly identical with, or at least closely akin to, the gutturals still existing in German (as in *noch*, *nicht*, *Tag*), and some one or more of which once existed in our own tongue. This we know from the orthography itself; for doubtless *some* sound is represented by the *h*, *hh*, ȝ, or *gh*, in *riht*, *rihht*, *ryȝt*, *right*, since, when the orthography of a language is unsettled, it is inconceivable that unpronounced letters should habitually be written; and it is notable that in the rhymes of Chaucer and of Early English poems generally, these letters play an important part, it being a rare exception if a word containing *gh* rhymes with one without *gh*. *Some* sound therefore is represented by the *gh* in these words, and it was doubtless a guttural; and it is this sound which is turned into an *r* in many words in the Devonshire dialect. Nothing can be more erroneous than to suppose that we have simply an *r inserted* in such cases, witness the following:—

Caught, Laȝ. Br. *cahte*, *cæhte*, *ikahte*, Dev. *kort*. *Daughter*, A. S. *dohtor*, Germ. *tochter*, Dev. *darter*. *Night*, Germ. *nacht*, Orm. *nihht*, A. S. *niht*, *næht*, *neaht*, Dev. *neart*. *Thought*, A. S. *þohte*, Dev. *thort*. *Might*, Germ. *macht*, Orm. *mihht*, A. S. *miht*, *mæht*, *meaht*, Dev. *meart*. *Aught* and *naught*, A. S. *aht* and *naht*, Orm. *ohht* and *nohht*, Dev. *ort* and *nort*. And the verb *ought*, A. S. *aht*, *ahte*, *æhte*, is in Dev. *ort*.

Finally and briefly: we are now in a position to explain the apparent, and apparently inexplicable, interchange of *r* and *f*, which we find at least in two words *zart* (Dev.) = soft, and *arter* = after. The fact is that *f* is *not* turned into *r* in these words.

Soft, A. S. *seft*, besides exhibiting the guttural in Germ. *sacht*, Dan. *sagte* (soft, gentle), Dutch *zacht*, Old Dutch (ap. Kilian) *saecht* and *sacht*, Sw. *sakta* (gentle, slow), has in Early English also the form *saught;* and *after* appears with a guttural in the Old Saxon *agter* and the Early Dutch *agter* and *achter*. These therefore are the forms which, slightly corrupted, survive in *zart* and *arter*.

THE END.

THE SECRETARIES regret that, from unavoidable circumstances, they have been prevented from including in this Report the Catalogue of the Birds of Cornwall, by Mr. E. Hearle Rodd. The Paper by Mr. Weymouth, on the letter 'R,' appears in its stead.

ERRATA.

P. 51, line 4, *for* "FALCONIDŒ" *read* "FALCONIDÆ."

P. 54, line 2, *for* "STRIGIDŒ" *read* "STRIGIDÆ."

" " line 11 from bottom of page, *for* "PICIDŒ" *read* "PICIDÆ."

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